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FOREST FLORA

OF THE

SIWALIK AND JAUNSAR FOREST DIVISIONS OF THE UNITED PROVINCES OF AGRA AND OUDH,

BEING A REVISED AND ENLARGED EDITION

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THE FOREST FLORA OF THE SCHOOL CIRCLE, N.-W. P.,

WITH

ANALYSES,

COMPILED FOR THE USE OF THE STUDENTS OF THE IMPERIAL FOREST COLLEGE, DEHRA DUN,

BY

UPENDRANATH KANJILAL, RAI BAHADUB, F.L.S.,
RXTBA-DEPUTY CONSERVATOR OF FORESTS.



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INTRODUCTION TO THE FIRST EDITION.

THIS work is due to the necessity, which has made itself much felt of late, of having a simple Flora for the use of the students of the Imperial Forest School to assist them in identifying the trees and shrubs, etc., which they meet with when engaged on excursions and on practical work in the forests of the School Circle of the North-Western Provinces, which are their training ground. Had it been possible to provide a new and cheaper edition of the splendid "Forest Flora of North-West and Central India," by SIR D. BRANDIS, K.C.I.E., F.R.S., this work might not have been required, but circumstances have prevented the issue of that new edition, and a Forest Flora of our own became a necessity. It was with very great pleasure that I was able to advise an old Dehra Dún student, and a native of India. to undertake a task which he was really the first fully to represent to me as urgently wanted for students' use. He was at first very diffident about it, but, on my urging him to take it up, he agreed to try and carry it He has worked very hard at it, in the intervals of the arduous duties of instruction of the Lower Vernacular Class at the School, and I have every hope that the results of his labours will prove satisfactory and that his Flora will be useful, not only to the students who are qualifying for the provincial service.

but to all officers of either service whose work lies in the School Circle and the Circles adjoining.

I believe this to be the first botanical work of any importance which has ever been prepared by a native of India, and the Imperial Forest School may well be proud of having educated at least one native gentleman who has taken up Botany as a study, and botanical work as a labour of love.

The book does not, of course, pretend to be original; it is based upon the "Flora of British India," the monumental work which we owe to the indefatigable labour of Sir Joseph Hooker, G.C.S.I., etc., and which took from 1872 to 1898 to complete, and which, as its author distinctly says in his "Preface," was intended "to facilitate the compilation of local Indian Floras." Babu Upendranath has also had before him the clear and accurate descriptions and the lucid analyses of the "Forest Flora of North-West and Central India" already referred to, and he has been able to consult many other books and writings of importance in the Library of the Forest School. This alone, however, would not have sufficed: it was necessary to examine, dissect and describe the plants themselves either living as they were met with in the forests, or dried and preserved in the Herbarium at Dehra Dún which contains now an excellent collection of specimens of the plants of India, and more especially of the trees, shrubs, climbers and herbs of economic forest value.

The real test of the value of Babu UPENDRANATH'S work will be afforded by the experience of some years'

use of it in the field. That I myself shall be unable to use it and test it in that way, I must regret; but I am confident that the test of experience will be a successful one, and that this Flora will prove valuable to many successive classes of Forest Students and many successive Forest Officers, whose duties may call them to the beautiful forests of the Dún and the splendid scenery of the adjoining Himalayan Mountains.

Besides such help as I have been able to give him myself, Babu UPENDRANATH has had great assistance from Mr. J. F. DUTHIE, B.A., F.L.S., the present Director of the Botanical Department of Northern India, who has now during the whole of the twenty years since the Imperial Forest School was founded, taught Systematic Botany to successive classes, both in the lecture room and in the field. Among other officers whose work either in the way of published writings, list of plants, etc., or of collecting specimens for the School Herbarium, has contributed to the present Flora, may especially be mentioned Messrs. A. SMYTHIES, N. HEARLE, and Pandit Keshavánand, all of them at one time or another connected with the School.

The area taken up in the Flora is the area of the School Circle Conservatorship, i.e., the district of Saháranpur, especially the Siwalik portion; the district of Dehra Dún, including the hills of Málkōt and Mussoorie and the parganas of Jaunsar-Bawar; the portion of the State of Tehri-Garhwal in the valley of the Upper Tons and its tributaries, the Pábar and Rupin, the forests of which are leased by Government for purposes of Forest

Conservancy; and the similar leased forests in the territories of the Thakurs of Raiengarh and Dádi of the Simla Hill States. In elevation, this area passes from only a few hundred feet above the sea at Saháranpur, to the extreme limit of vegetation in the Himalayas; it is consequently not entirely a correct geographical field, but a field of study whose limits are fixed by the same political reasons that fix the area controlled by the Conservator of the School Circle.

It has not been considered necessary to enter at length into synonymy in this work. Those who desire to do so can always consult the "Flora of British India" which has invariably been quoted. Nor has it been thought advisable usually to give vernacular names from regions outside the School Circle area; or to quote uses and information, unless they are likely to be useful in that area.

The work has run to rather a greater length than was at first contemplated; but it is hoped that this will prove rather an advantage than a drawback.

J. S. GAMBLE.

DEHRA DÓN; 4th February 1899. Conservator of Forests, School Circle, N-W. P. and Oudh, and Director of the Imperial Forest School, Debra Dún.

COMPILER'S PREFACE TO THE FIRST EDITION.

ALTROUGH in the Introduction which he has so kindly written for me, Mr. Gamble has explained the circumstances under which this book came to be written, he has said nothing about its general plan and the way in which it is intended to be used, and I think it best, therefore, to add a few further words in explanation.

The chief object has been to render the work of any one consulting the book as easy as possible, by giving him analyses based on the most obvious characters of the Orders, the Genera and the Species. To those who are fairly good botanists, the Order and perhaps the Genus will suggest themselves at once, and so the key to the Species will alone come into use; sometimes the Order will be known but not the Genus, and then recourse will be had to the Generic key, to be followed when the Genus is ascertained, by that to the Species; often the Order itself will not be known, and then the searcher must look in the analyses of Orders; and finally there may be cases where the Division, or even the Section, of the Vegetable Kingdom is not apparent, and he will have to begin from the very beginning of all-

In using the keys, the student should bear in mind that identification is arrived at by a continued process

of elimination. Thus he should first of all determine, from the key given in page 1, the Section and the Division of the Vegetable Kingdom under which the plant he wants to identify is likely to come. This primary division, it will be seen, is based exclusively on the characters of the flowers; leaf and fruit characters do not enter into it. Next follow the analyses of the great Divisions into Natural Orders. It will become evident at this stage how important it is to have a specimen complete with leaves, flowers, and fruit,-for all these characters have been employed in drawing up these and subsequent keys. To facilitate reference, the Natural Orders have been numbered consecutively all through, and the numbers and names have been repeated at the top of each page in the body of the Flora. The key to the Natural Orders was the one the most difficult to prepare, and I am fully conscious that it may have defects; but I can only hope they are few.

Having arrived at the Natural Order that seems the most likely, the student should at once turn to its description in the proper place, and compare the characters given there with those of his specimen; for the characters given in the keys usually occur with considerable variation, or are difficult of determination, and are therefore not always quite a safe guide.

When fully satisfied as to the Natural Order, the student should proceed to the Genus, and last of all, to the Species, in exactly the same way as above, viz., first by the keys and then by comparing his plant with the descriptions. Generic characters have not, however,

been separately given in the case of such Genera as have only one Species.

In describing characters the same sequence has been followed throughout the book. Adhering to the same principle, the several items in the description of the leaves—the most obvious of all organs for the purpose of identification—have been given, as much as possible, in a definite order. This indeed can be claimed as a special feature of the book, and it may not be out of place to state it here:—

- Disposition, i.e., opposite, alternate, or whorled.
- 2. Form, i.e., simple or compound.
- 3. Dimensions, of the blade only.
- 4. Shape, including the termination.
- 5. Margins, whether entire, wavy or cut in any way.
- 6. Consistence, i.e., whether membranous or coriaceous, tough, fleshy, soft or hard.
- 7. The Surfaces, including their indumentum.
- 8. Venation.
- 9. The Base, —any peculiarity regarding it not brought out in item 4.
- 10. The Petiole, its length, etc.
- 11. The Stipules, if present.

In the case of compound leaves, the leaflets have been described separately, generally beginning with item 3 if the leaf is digitate, or only omitting item 2 if it is pinnate. The advantages of such an arrangement are too obvious to require any further remark.

The descriptions of leaves are followed by those of the inflorescences, flowers and fruits. Sometimes it may happen that either flower or fruit is missing, and then the work will be more difficult, but a little thought may often lead the searcher into the right track, and he may be enabled to make, at any rate, a shrewd guess at his plant. To those, who, like the officers and students at or near Dehra, have the opportunity of doing so, it is strongly to be recommended that having arrived at what they conceive to be their plant, they should take an early opportunity of making sure by comparing their specimens with the named sheets in the collection. To facilitate this, the numbers of Natural Orders and Genera have invariably been quoted from HOOKER & BENTHAM'S "Genera Plantarum," and the Species under each Genus have been arranged in the sequence in which they occur in the "Flora of British India."

A glossary of Botanical Terms has been added, in the preparation of which I have been greatly helped by the lately published Glossary of Mr. R. L. Heinig, from which useful book some of the definitions have been taken *verbatim*,—and also by Mr. A. F. Gradon, the Botany Instructor at Dehra Dún, who has kindly examined and verified my draft.

It seems proper to mention that a few plants have been included that are not exactly woody, and also a few that are, properly speaking, not indigenous, although successfully cultivated in the School Circle. In either case, their economic value or botanical importance, or both, have been considered sufficient to warrant this deviation.

I hope I may be allowed to add here my own acknowledgments for the encouragement they have given me, to the Inspectors General of Forests, Mr. B. RIBBENTROP, C.I.E., and Mr. H. C. HILL, and to the Directors of the Imperial Forest School under whom I have served,—Mr. H. C. HILL, Mr. J. W. OLIVER. and more especially to Mr. J. S. GAMBLE, M.A., F.R.S., C.I.E., as it was during his tenure of office, and under his guidance, that the first draft was completed. But for his constant encouragement and ever ready help. I might have been content with a much smaller effort. My thanks are also due to Mr. DUTHIE, who, as my Instructor in Systematic Botany, has always evinced a special interest in my undertaking. I am also greatly obliged to Pandit KESHAVÁNAND, now Conservator of Forests in the Tehri-Garhwal State, for considerable help in supplementing and verifying the vernacular names collected by Messrs. HEARLE, SMYTHIES. FERNANDEZ and others. Not being myself an inhabitant of the North-Western Provinces, some such help was much wanted, and I could not have found it in any one better than in my friend Pandit KESHAVÁNAND.

I am fully conscious of many defects, and that, in spite of my best endeavours, many errors,-technical, literary and typographical,-must have crept in. If those, who may use this book, will kindly inform me of

x Compiler's Preface to the First Edition.

them from time to time, with a view to their correction in any subsequent edition, they will lay me under a great obligation.

UPENDRANATH KANJILAL,

Extra-Assistant Conservator of Forests.

DEHRA Dún; 26th March 1900.

PREFACE TO THE REVISED EDITION.

In this edition, besides the usual corrections, many important changes have been introduced and attempts have been made to effect some improvements. First of all the title of the book had to be changed, the area to which it applied having changed its name, in respect of both general and forest administration, since the publication of the first edition in 1901. Then, following the recommendations of the International Conference held at Vienna in 1905, the word Family has been used in this edition to indicate what were described as Natural Orders in its predecessor, while Cohorts have been called Orders. The names of some Families also have undergone slight or complete changes in deference to the rules laid down at the above Conference.

It was found out at actual teaching that the keys to the Families, although of considerable use in the field for the practical purpose of quickly 'running down' a plant to its Family, were nevertheless essentially of an artificial nature, and therefore could not convey to the student a clear idea of the distinctive characters and relative positions of the Families. To remedy this defect an analytical synopsis has been added in which the Families have been grouped first under Orders, and again the Orders themselves under the Classes and Divisions, care being taken throughout

to avoid repetition and duplication in stating their chief characters. Although in the matter of grouping PRANTL and VINE's system has been generally followed, the characters of Orders have almost in all cases been amplified or modified with special reference to Indian Families of plants, and more particularly to those actually comprised under each in this Flora. It is hoped that this synopsis will prove useful to students. To make their work easy the Orders have been indicated in their proper places in the body of the Flora. All the keys throughout the book have been revised and in some cases recast, generally in the light of further experience gained at actual teaching. The Glossary also has been considerably added to, so that it may now be more confidently said that no technical term has been used in the text that has not been defined in the Glossary.

The sequence of HOOKER & BENTHAM'S "Genera Plantarum" and the "Flora of British India" has been deviated from towards the end of the book inasmuch as the Monocotyledons and the Gymnosperms have been made to change places with a view to assigning to them their more correct morphological position, and the last four Families of the Apetalæ have been rearranged to make them fit properly into their respective Orders.

The descriptive part of the Flora has been increased by the inclusion of ten additional species, viz., Delphinium vestitum, Rhus succedanea, Sicgesbeckia orientalis, Diospyros Kanjilali, Linociera intermedia, Tylophora tenuis, Asparagus adscendens, Smilax macrophylla,

Acorus Calamus, and Coix Lachryma Jobi. while three species, viz., Grewia tiliatolia, Smilax elegans and Typha Laxmanni, have been deleted as their inclusion did not appear to have been based on sufficient grounds. The claims of Teak for a fuller description than was given it in the first edition having been recognised, Tectona has been included in the generic key under VERBENACEE: also the generic description of Juniperus has been added. For the rest, besides the incorporation of corrections and of such additional information as has since been gathered. the descriptions themselves have been thoroughly revised, especially with a view to making them clearer than in the former edition. In all other respects. however, this part of the book has remained unchanged.

Only a few of the synonyms have been changed, but to the references quoted in the first edition has been added the "Indian Trees," the late Sir D. Brandis' monumental work, while the quotations for Mr. Gamble's classical work, the "Manual of Indian Timbers," have been corrected throughout to refer to his much enlarged new edition of 1902. Mr. Duthie's excellent "Flora of the Upper Gangetic Plain" and Col. Prain's critical monographs on Dalbergia and Additional Leguminose have also been quoted in a few cases.

Mr. Gamble has again laid me under a debt of obligation by kindly looking through a part of the proofs and assisting me with very valuable suggestions

and advice, and I take this opportunity to give expression to my thankfulness to the Inspector-General of Forests to the Government of India for entrusting me with the preparation of this revised edition of the Flora. I am also much indebted to Mr. R. S. HOLE, F.C.H., F.E.S., F.L.S., the Imperial Forest Botanist, for necessary guidance and many valuable suggestions and also to my friend and former pupil Mr. V. SUBRAMANIA IYER, M.A., F.L.S., officiating Forest Zoologist, for supplying me with a very comprehensive list of corrections and suggestions. many of which were most valuable. In fact, it is very gratifying that the request expressed in the last sentence of my preface to the first edition has generally been responded to with great alacrity. especially by those whom I had the honour of teaching Systematic Botany at what was then the Imperial Forest School: I cannot, therefore, do better than conclude this preface with an expression of gratitude to these gentlemen, coupled with a repetition of the same request in respect of the present edition, which, having had to be prepared under somewhat unfavourable circumstances far away from a library and a herbarium, cannot be expected to be entirely faultless.

UPENDRANATH KANJILAL, Extra-Deputy Conservator of Forests.

SIBSAGAR; 23nd November 1909.

GLOSSARY

OF THE

BOTANICAL TERMS

USED IN THE TEXT.

Accrescent, increasing in size with age; usually said of parts of the calyx or corolla that persist and enlarge after flowering.

Achene, a small dry indehiscent 1-celled 1-seeded fruit, or a 1-seeded carpel of an apocarpous fruit.

Acicular, needle-shaped; long and slender.

Acorn, fruit of the oak, i.e., a nut enclosed within a cup formed of an involucre of thickened bracts.

Acumen, a sharp tapering point more or less prolonged. Acuminate, terminating in an acumen.

Acute, evenly tapering and ending in a narrow angle, but without a prolongation.

Adnate, said of dissimilar organs when congenitally united.

Adpressed, lying close against the producing surface.

Adventitious, occurring in \all all unusual position.

Æstivation, the mode in which the parts of a flower are folded in the bud; also their relative position.

Albumen, the nutritive substance found within the seed-coats of some seeds and outside the embryo.

Amplexicaul, said of a sessile leaf or the base of a petiole when clasping the etem.

Anastomosing, reticulately united.

Anatropous, said of an inverted ovule, i.e., one with the foramen close to the hill in, and the chalaza at the opposite end, the axis of the ovule itself remaining straight.

Androgynous, said of an inflorescence bearing both male and female flowers.

Annulate, marked transversely by rings.

Anterior, said of that part of a flower which is inserted away from the axis of inflorescence; inferior.

Anther, the part of a stamen that bears the pollen.

Apiculate, with a short pointed tip.

Apocarpous, with the carpels free and distinct.

Arcuate, shaped like a bow, i.s., moderately curved.

Aril, arillus, an accessory seed covering or an appendage growing from or about the bilium of a seed. Arillate, having an aril. Arillode, a false aril.

Arista, an awn or bristle. Aristate, bearing or terminating in an arista.

Articulate, jointed in such a manner as to separate at maturity.

Ascending, directed obliquely

upward.

Auriculate, having a flat lateral expansion like the lobe of the ear.

Awn, a bristle-like appendage, especially of the glumes of grasses.

Axil, the upper angle formed by a leaf or a similar organ and the supporting stem or axis. Axillary, in or relating to the axil.

Axile, relating to the axis, generally said of a kind of placentation in which the ovules are borne on the central axis of the ovary.

Baccate, berry-like, pulpy.
Basifixed, fixed by the base, especially said of an anther attached at its lower end to the top of the filament; innate.
Bast, fibrous inner bark.

Berry, a simple fruit succulent throughout, without a stone, and generally with more than one seed.

Bifarious, in two opposite vertical rows.

Bifid, divided into two segments to about the middle with a narrow sinus. Bifurcate, two-forked, having two prongs or branches. Bilabiate, having two lips.

Bipartite, divided into two segments almost to the base.

Bipinnate, twice pinnate.

Biseriate, in two series or rows, generally one above or within the other.

Bisexual, having both stamens and pistil in the same flower; hermaphrodite.

Biternate, twice ternate.

Bole, the main axis or trunk of

Bract, a rudimentary or modified leaf subtending a flower or an inflorescence. Bracteate, having bracts.

Bracteole, a secondary bract or one of the ultimate grade subtending each flower of an inflorescence. Bracteolate, having bracteoles.

Bulb, a short stem, more or less conical above and flattened at the base, and usually underground, which bears a bud or buds concealed in fleshy scales or coats. Bulbiform, formed like a bulb. Bulbous, of the nature of the bulb.

Buttressed, said of stems with vertical ridges or projections, e.g., the stems of Semal, Sundri. etc.

Caducous, falling off very early.
Cæspitose, tufted or growing in
4tufts, e.g., many species of bamhoos.

Callus, the new tissue which forms over the wounds of plants.

Calyx, the outer whorl of floral leaves, immediately below or outside the corolla. Calvcine. relating to the calyx.

Calvotra, a cap, hood or veil.

Cambium, a zone of tender thinwalled cells separating the wood from the bark in Dicotyledons and Gymnosperms, by the division and growth of which new cells are formed.

'Campanulate, bell-shaped, deeper than cup-shaped.

Canescent, with very short grey hairs or pubescence giving the epidermis a grevish-white hue. Capitate, having a globose head.

Capsule, a dry syncarpous fruit the carpels of which open or separate at maturity.

Carpel, the ovary of an apocarpous pistil, or one of the component parts of a syncarpous ovary. Carpellary, relating to a carpel.

Cartilaginous, firm and tough like parchment.

Caryopsis, a grain; the seed-like fruit of Graminess with thin pericarp, which is usually adnate to the contained seed.

Catkin, a scaly spike or raceme of unisexual flowers, pendulous or drooping, and generally deciduous.

Caudate, furnished with a tail, or with a slender *tail*-like terminal appendage.

Cell, the living vegetable unit: the structural unit in the formation of a plant. Also one of the cavities of an ovary or of an anther.

Chalaza, that part of the ovule where the base of the nucleus is confluent with the coats.

Chartaceous, having the texture of

writing paper; thin and flexible. Ciliate, fringed with thick marginal hairs like the eyelashes.

Cirrhose, bearing tendrils.

Cladode, a branch, more or less flattened which assumes the form and functions of a leaf.

Clavate, club-shaped; slender below and gradually thickened upward.

Cocci, pl. of coccus, the seed-like and generally 1-seeded lobes of a syncarpous ovary which become more or less dry, and separate at maturity.

Cogener, one of the same genus.

Coma, a tuft of soft hairs or cotton borne on a seed. Comose. having a coma.

Concolor, of the same throughout.

Conduplicate, folded once upon itself lengthwise.

Cone, the multiple fruit of Conifers formed mostly of imbricated scales by which the seeds are subtended.

Connate, said of similar organs or parts of the same organ when congenitally united.

Connective, the portion of a stamen that connects the two lobes or cells of an anther.

Connivent, conniving, said of sepals, petals or anthers having the apex arching over or converging in the centre of the flower.

Contorted, convolute, said of or petals with one leaves margin within, and the other margin without, the whorl.

Cordate, heart-shaped, i.e., with the base shaped like the figure of a heart on cards.

Coriaceous, leathery; tough and thick.

Corm, a solid fleshy underground stem more or less jointed and naked or within thin scales, such as is characteristic of certain families, e.g., Aroideæ. Corolla, the inner whorl of floral

Corona, a crown; the crown-like process from the inner face of petals or the throat of a corolla, or from stamens.

Cortical, relating to the cortex or

Corymb, an inflorescence of the indefinite or centripetal kind in which the branches or pedicels, although starting from different points, all attain almost the same level.

Cotyledons, the seed-lobes or first leaves of an embryo.

Crenate, with rounded teeth.

Cruciform, in the form of a cross; generally said of flowers with four petals arranged crosswise.

Crustaceous, hard and brittle; said of a covering which splits and breaks off easily.

Culm, the hollow and jointed stem of grasses, especially of bamboos.

Cuneate, wedge-shaped, acuteangled at the base.

Cupula, cupule, a cup-like involucre of thickened bratts supporting the nut of the oak. Cupular, belonging to, or shaped

like, the involucre cup.

Cusp, a long and tapering rigid point. Cuspidate, furnished with a cusp.

Cuticle, the outermost layer of the epidermis.

Cyme, an inflorescence of the definite or centrifugal type.

Cypsela, a dry interior achene invested with the adnate calyx; the fruit of Composite.

Decandrous, with ten stamens.

Deciduous, said of trees or shrubs which are leafless for a part of the year; also of the leaves of such plants.

Declinate, bent to one side.

Decompound, compound or divided more than once.

Decurrent, running down into; said of a sessile leaf when the blade is prolonged below the insertion and so runs down the stem.

Decussate, in pairs alternately crossing at right angles.

Dehiscence, the mole of opening of a capsule or of an anther.

Deltoid, triangular in outline or in section like the Greek letter Δ.

Dentate, with margins cut into triangular salient teeth directed outward. Denticulate, minutely toothed.

Dextrorse, turning or twining from left to right, i.e., in the anti-clockwise direction.

Diadelphous, said of stamens united by their filaments into two sets of bundles.

Dichotomous, forked in pairs.

Didynamous, said of a flower with two long and two short stamens, and also of stamens when they are such.

Digitate, finger-like; said of a compound leaf with the leaflets all borne on the apex of the common petiole.

Dimorphic, dimorphous, having two forms, generally said of hermaphrodite flowers having one form with long styles and short stamens, and another with short styles and long stamens; also of leaves if of two widely different shapes on the same stem.

Diœcious, unisexual with the male and female flowers on separate individuals.

Disk, a circular enlargement of the receptacle in the form of a cup, or of a cushion. Discoid, disk-like; circular and flat or depressed in the centre.

Dissepiment, a partition in an ovary or pericarp in the direction of its length.

Distichous, arranged in two opposite vertical rows.

Divaricate, spreading widely apart.

Dorsal, relating to, inserted on, or opening by, the back or outer suture.

Drupe, a stone-fruit, i.e., one with a fleshy or pulpy pericarp and a bony or crustaceous endocarp. Drupaceous, like a drupe.

Ebracteate, without bracts.
Ebracteolate, without bracteoles.

Echinate, set all round with sharp bristles like a hedge hog.

Eglandular, without glands.

Elliptic, elliptical, oblong or oval with rounded ends. Ellipsoid, a solid with an elliptical outline. Emarginate, with a notch at the

apex.

Embryo, the rudimentary plantlet formed in a seed. Endocarp, the inner layer of the pericarp.

Endosperm, the albumen of a

Ensiform, in the shape of a sword. Epicalyx, a whorl of bracts below the calyx proper and somewhat resembling it in shape and colour.

Epicarp, the outer layer of a pericarp.

Epidermis, the outermost layer of tissue or skin of a plant.

Epigynous, inserted on the top of the ovary.

Epipetalous, said of stamens which are borne on, or adnate to, the petals or corolla.

Epiphyllous, growing on leaves or perianths.

Epiphyte, a plant growing on, but not nourished by, another plant. Epiphytic, having the habit of an exiphyte.

Evolution, the mode and particularly the sequence in which flowers open on the same inflorescence.

Exalbuminous, without albumen. Excavate, hollowed into broad deep pits.

Exocarp, the external layer of the pericarp when an endocarp is present.

Exstipulate, without stipules.

Extrorse, applied to anthers that dehisce towards the circumference of the flower.

Falcate, curved like the blade of a sickle or southe.

Family, a group of co-related genera which are sometimes grouped into tribes. Farina, starch, or anything resembling it or analogous to it.

Farinaceous, consisting of or resembling starch.

Fascicled, fasciculate, in dense clusters.

Ferruginous, coloured like iron-rust.

Fibrovascular, said of a tissue consisting of woody fibres and ducts or vessels.

Filament, the stalk of an anther. Filiform, thread-like; long and slender.

Fimbriate, having a fringe or border of fine thread-like processes.

Floccose, woolly with locks of dense soft hairs that are easily detached.

detached.
Foliaceous, of the form or texture of a leaf.

Follicle, a fruit of a single carpel opening by only one, usually the inner, suture. Follicular, pertaining to or resembling a follicle.

Foramen, the minute aperture in the coats of an ovule corresponding to the micropyle of a seed.

Free, distinct, not adnate to any other organ. Free-central, said of the placenta of a one-celled ovary when it is like a column in the centre bearing ovules on the upper extremity.

Fugacious, falling off or fading very early.

Funicle, the stalk of an ovule or seed.

Fusiform, spindle-shaped; solid and tapering at both ends.

Gamopetalous, having combined petals.

Gamophyllous, said of a flower having a perianth of united leaves or segments; also applied to such a perianth.

Gamosepalous, having combined

sepals.

Genus, pl. genera, a group of closely related species indicated by the first name of a plant.

Gibbous, having a pouch-like swelling or protuberance on one side.

Glabrous, without hairs of any kind. Glabrate, somewhat glabrous. Glabrescent, becoming glabrous.

Glands, small wart-like bodies or round excrescences of any kind found on stems, petioles, etc., or inside flowers. Small raised superficial dots, or minute vescicles imbedded in the substance of leaves, etc., usually filled with oil. Glandular, having glands, or relating to glands.

Glaucous, of a bluish-grey colour, often covered with a fine bloom.

Glumes, the chaffy bract-like scales of the inflorescence of grasses and their lies. Glumaceous, resembling or relating to glumes.

Gonophore, a stipe or stalk supporting both stamens and

ovary in a flower.

Gynobase, a short and broad elongation of the torus on which the pistil rests. Gynobasic, resting on a gynobase.

Gynophore, the stipe or stalk supporting an overy.

Haustorium, pl. haustoria, a sucker-like root by means of which a flowering parasite draws nourishment from its

Head, a form of inflorescence consisting of a more or less dense cluster of sessile flowers which are centripetal in evolution.

Hermaphrodite, bisexual; having both stamens and pistil in the same flower.

Heterogamous, said of flowerheads when male, female, bisexual and neuter florets, or any two or three of these, are borne on the same head.

Hilum, the place of attachment of an ovule or seed to the placents or funicle.

Hirsute, thickly covered with long and rather coarse hairs. Hispid, beset with rigid or bristly

hairs.

Homogamous, said of a flowerhead with the florets all of the same sex.

Hyaline, transparent or translucent and colourless.

Hypocrateriform, salver-shaped; said of a corolla with a slender tube abruptly expanded into a flat horizontal limb.

Hypogynous, inserted below the ovary.

Imbricate, overlapping so as to break joints like tiles on a roof. Imparipinnate, unequally pinnate; pinnate with a terminal leaflet or pinna.

Incomplete, said of a flower wanting calyx or corolla or both.

Indumentum, a general term for any kind of hairy covering or coating produced by the epidermis.

Induplicate-valvate, said of members of a whorl when they touch one another with the margins of each folded inward.

Inferior, inserted below the ovary and free from it, if said of the calyx; adnate to, or situated below the calyx, if said of the ovary; also anterior, gwhen said of the relative position of the parts of a flower in an inflorescence.

Inflorescence, the mode in which flowers are arranged on the stem. Also used as a collective term for the whole flowering portion of the stem of a plant with its branches, bracts; bracteoles and flowers.

Innate, said of an anther borne on the appex of the filament and with usually marginal dehiscence.

Integuments, the soats of an ovule or seed.

Interpeticlar, said of stipules of opposite leaves and inflorescences when they are inserted between the peticles, i.e., across the stem.

Intrapetiolar, is applied to stipules of single leaves when they are connate by their margins so as to form apparently one stipule.

Introrse, applied to anthers that dehisce towards the pistil.

Intruded, projecting inward.

Involucre, a circle of bracts subtending a flower-cluster.

Involute, rolled inward.

Irregular, wanting in symmetry of form, said of flowers with the petals or perianth-segments unequal in size and shape. Keel, the central dorsal ridge, like the prow of a boat, formed by the two anterior and innermost petals of a papilionaceous corolla.

Kernel, the conter ts of the putamen of a drupe.

Labiate, two-lipped.

Laciniate, irregularly cut or fringed into narrow lobes or segments with narrow sinuses.

Lanceolate, shaped like a lancehead, i.e., 2-4 times as long as broad, narrowed at both ends, especially towards the apex, and broadest below the middle.

Lax, diffuse, said of an inflorescence when the flowers or fruits are notelosely arranged on it.

Legume, a fruit of a single carpel usually opening by both sutures when ripe. See Pod.

Lenticel, a lentil-shaped corky process developed on the bark of some trees. Lenticellate, having lenticels.

Lenticular, lentil-shaped; like a double-convex lens.

Ligule, anything shaped like a strap, such as the limb of the ray-corolla in some Composits. The thin and scarious projection from the summit of the sheath of the leaf of grasses. Ligulate, strap-shaped, usually applied to the ray-flowers of Composits.

Linear, narrower than lanceolate,
—at least five times as long as
broad.

Lobulate, divided into small lobes. Loculicidal, applied to a kind of deriscence in which the splitting takes place through the cells. Loculus, the cell of an ovary; pl. loculi.

Lodicule, one of the small scales which represent the perianth in the flower of a grass, cocurring usually in pairs.

Lyrate, rinnately lobed with a large terminal lobe and one or more pairs of small basal lobes, so as to resemble a lyre.

Mammillate, having nipple-like prominences.

Median, relating to the middle; in a plane radial to the axis of a plant.

Medullary rays, vertical plates of cellular tissue which radiate from the centre of a cicoty-ledonous plant towards the cambium.

Mesocarp, the middle layer of the pericarp.

Micropyle, the minute orifice in the coats of a seed represented by a sear, corresponding to the foramen of an ovule.

Monadelphcus, said of stamens united by their filaments into one set forming a tube or column or sheath.

Moniliform, cylindrical and constricted at regular intervals so as to resemble a necklace of beads.

Monoecious, unisexual with the male and female flowers on the same individual.

Monopodial, pertaining to or of the nature of a monopodium, i.e., a simple axis prolonged by means of a terminal bud.

Mucronate, abruptly terminating in a short straight stiff and sharp point. Multifarious, in many vertical rows.

Multifid, cleft into many lobes or

Muldiseriate, in many series or rows.

Needles, the acicular leaves of confers.

Nerves, the principal lateral ribs of a leaf. Nervose, with nerves strongly developed.

Nucleus, the central part of an ovule or cell; pl. nuclei.

Nut, a hard ind hiscont 1-seeded fruit resulting from a syncarpous ovary.

Obconic, inversely conical, i.e., with the attachment at the pointed end.

Obcordate, inversely cordate, i.e., broadly two-lobed with a notch at the apex.

Oblanceolate, inversely lanceolate, i.e., long, narrow and tapering at both ends, but broadest above the middle. Oblanceoloid, said of a solid having an oblanceolate outline. Oblong, much longer than broad with the sides nearly parallel.

Obovate, inversely ovate, i.e., egg-shaped in outline with the broad end towards the apex.

Obovoid, said of a solid which is

inversely egg-shaped in outline.

Obsolete, rudimentary, imperfectly developed.

Obtriangular, in the shape of an isosceles **friangle** with the attachment at the apex.

Operculum, a lid; a top which separates by a transverse line of separation. Orbicular, orbiculate, flat with the outline circular or nearly so.

Order, a group of closely related Families of plants.

Ovary, that portion of the ristil which includes one or more

which includes one or more cavities or cells containing one or more ovules.

Ovate, egg-shaped in outline with the broad end towards the base.

Ovoid, said of a solid with an ovate or oval longitudinal section.

Ovule, the immature or undeveloped seed in the ovary.

Palea, the innermost glume of the flower of a grass, or the chaffy scales on the receptacles of many Composits. Paleaceous, chaff-like.

Palmate, with the midribs of the lobes or leaflets all rediating from the apex of the petiole.

Palmatilobed, palmately lobed.

Palminerved, with nerves radiating like the ribs of a palmateleaf. Palmatipartite, with segments palmately separated almost to the base.

Pandurate, fiddle-shaped.

Panicle, an inflorescence in which the axis is divided into branches bearing two or more flowers; a compound raceme or compound irregular corymb.

Papilionaceous, butterfy-like; applied to the kind of corolla characteristic of the Pea tribe of Leguminosæ; like the flower of the Pea tribe. See Keel, Wings and Standard.

Papillose, bearing minute nippleshaped projections. Pappus, thistle-down; the hairy tufts on achenes and other fruits.

Paraboloidal, said of a solid having a parabolic, i.e., ovateoblong outline.

Parasite, a plant that grows on or in another plant, and draws nourishment from it.

Parietal, attached to the inner wall of an overv.

Paripirmate, syn. abruptly pinnate, seenly pinnate; pinnate without the terminal leaflet or pinna.

Patent, widely spreading.

Pedate, like a bird's foot; palmately divided with the lateral divisions 2-cleft.

Pedicel, the ultimate stalk supporting a single flower in an inflorescence. Pedicellate, having a pedicel:

Reduncie, the stalk supporting a solitary flower or fruit or a cluster of flowers or fruits. Pedunculate, having a peduncie.

Pellucid, transparent or trans-

Feltate, target-shaped; said of a flat body, generally a leaf, a bract or a stigma, attached to the stalk by the lower surface.

Penninerved, pinnately nerved; with nerves spreading laterally from various points on the mid-

Pentand, divided into five parts with broad notches extending from the margin to about halfway towards the common axis.

Pentamerous, having the members in each whorl of the flower in-free:

Penultimate, next to the silier sie.

Perianth, a floral envelope; a term especially used when the calyx and corolla are similar in form and texture, or are represented by a single whorl.

Pericarp, the portion of the fruit formed of the ovary and whatever adheres to it, exclusive of, and outside, the seeds.

Perigynous, inserted around but away from the ovary.

Persistent, remaining attached; generally said of a calyx or a corolla which remains attached until the fruit is mature.

Petal, one of the parts or leaves of the corolla, whether free or combined. Petaloid, resembling or having petals.

Petiole, the stalk of a leaf.
Petiolate, having a petiole.
Petiolule, the stalk of a leaflet.
Petiolulate, having a petiolula.

Phloem, the soft tissue of the inner bark which is formed by the outer portion of a vascular bundle.

Pilose, thinly sprinkled with long soft simple hairs.

Pinna, pl. pinnæ, the primary division of a bipinnate er tripinnate leaf. Pinnule, the secondary division of a tripinnate leaf.

Pinnate, a compound leaf is so called when the leaflets are arranged on either side of a common axis in the same way as are the webs of a feather on its shaft.

Pinnatisect, pinnately cut nearly to the common axis:

Pistil, the female organ of a flower consisting normally of overy

style and stigma. Pistillode, a rudimentary or barren pistil. Placenta. that portion of the

interior of an overy on which the ovules are borne.

Plaited, plicate, folded in longitudinal plaits.

Plumose, feathered; said of bristles having fine hairs on either side like the plume or webs of a feather.

Pod, the same as Legume, but has a wider application, being used to denote any dry dehiscent many-seeded fruit, especially when it is much longer than broad.

Pollen, minute powder-like grains contained in the anther-cells,—the fertilizing agent of a plant.

Polyadelphous, having the stamens united by the filaments into many sets or bundles.

Polygamous, with hermaphrodite and unisexual flowers on one or different plants.

Polyphyllous, said of a perianth having distinct leaves or segments.

Pome, a succulent fruit with seeds in many cartilaginous dry cells, e.g., the apple and the pear.

Pore, a minute passage or orifice.
Posterior, said of that part of a
flower which is nearest to the
axis of inflorescence; superior.
Prickle, a sharply-pointed stiff
outgrowth of the epidermis.

Procumbent }, lying flat or close
Prostrate } to the ground.
Pruinose, covered with a

hoarfrost-like bloom or powder.

Pseudocarp, a false fruit; one
which has some portion other

than the ovary so developed as to resemble a fruit.

Pubescent, covered with short soft straight simple kairs.

Puberulous, puberulent, minutely pubescent.

Punctate, dotted with small punctures or glands. Punctulate, minutely punctate.

Pungent, terminating in, or tapering gradually to, a hard sharp point.

pom.

Pustular, with small blister-like elevations.

Putamen, the shell of a nut; the hard endocarp of a drupe.

Pyrene, one of the small stones of a drupaceous fruit having more than one stone.

Pyriform, pear-shaped; obovoid with a tapering base.

Quadrangular, four cornered. Quinquefoliolate, with five leaflets.

Raceme, an inflorescence of the indefinite kind in which the flowers are borne on pedicels of more or less the same length along a single undivided axis or rachis.

Rachis, the principal axis of a pinnate leaf or of an inflorescence. Rachillum, pl. rachilla, the secondary rachis of a compound spike; the rachis of a spikelet of grass.

Radicle, the axis of an embryo below the cotyledons.

Raphe, the cord or ridge which connects the hilum with the chalaza in an anatropous ovule. Raphides, needle-shaped crystals found in the cells of some

plants.

Ray, one of the radiating branches of an umbel. Ray-flowers. the marginal ligulate flowers of a head or circular flower. cluster.

Receptacle, the torus of a flower: hence also what is commonly known as the *iruit* of figs.

Regular, symmetrical; generally said of flowers with the petals or perianth-segments alike in size and shape.

Reniform, kidney-shaped; breader than long, broadly cordate at the base, and with the auricles rounded.

Repand, having a wavy margin. Reticulate, having the veins connected together like the meshes of a net.

Retuse, with as mall shallow notch in a rounded or truncate apex. Revolute, having the margins

or apex rolled backward upon the under surface.

Rhizome, an underground or prostrate jointed stem which sends off roots at the nodes and bears, like a true stem. buds, leaves, or scales.

Rhomboid, rhomboidal, with four sides more or less equal. and the lateral angles obtuse.

Rostrate, beaked; narrowed into a slender tip or process.

Rotate, wheel-shaped; said of a regular gamopetalous corolla with a short tube and a flat spreading limb.

Rotundate, circular or nearly so in outline.

Rugose. full of wrinkles. Rugulose, minutely wrinkled. Ruminate, mottled; marked by transverse lines or divisions.

Sagittate, shaped like an arrow. head; tapering towards the apex. bifurcate at the base. with the lobes pointed and directed downward.

Samara, an indehiscent dry winged fruit

Sarmentose. .producing long straggling woody branches.

Scabrous, rough to the touch owing to short stiff hairs. Scaberulous, somewhat ecab. rous.

Scape, a leafless and generally unbranched flower-stem rising from the ground.

Scarious, scariose, thin, dry, membranous, somewhat stiff and not green.

Scorpioid, said of a form of unilateral inflorescence which is coiled inward from the apex in the bud like the tail of a scorpion.

Sepal, one of the parts or leaves of the calvx, especially when not combined.

Septicidal, dehiscing through the dissepiments or lines of junction.

Septifragal, opening by valves breaking away from the dissepiments.

Septum, pl. Septa, see Dissepi. ment. Septate, divided by one or more partitions.

Serrate, toothed like a saw with the teeth directed forward. Serrulate, minutely serrate:

Sessile, attached directly without a stalk.

Setaceous, bristle like.

Sheath, a close-fitting tubular or enrolled case, e.g., the lower portion of the leaf of grasses,

Sigmoid, curved in two opposite directions like the Greek letter sigma or 5.

Simple, undivided; consisting of one b'ade when said of a leaf; resulting from a single pistil when said of a fruit; unbranched when said of a stem or tendril.

Sinistrorse, turning or twining from right to left, ie., in the alcok-wise direction.

Sinus, the space letween the divisions or lobes of a leaf. Sinuate, with an irregular wavy margin.

Spadix, a spike with a thickened or fleshy axis bearing 1-sexual flowers, generally sneathed in a spathe.

Spathe, a large sheath like bract enclosing a spadix. Spathaceous, spathe-like.

Spathulate, shaped like a spatula, i.e., broad and rounded at the apex but gradually narrowed towards the base.

Species, a group of individuals alike in all essential particulars; the subdivisions of a genus.

Spike, a form of indefinite inflorescence bearing sessile flowers on an undivided elongated common axis. Spicate, in the form of or resembling a spike, or disposed in spikes. Spikelet, a secondary spike; the ultimate flower-bearing stem of grasses including its glumes and flowers.

Spine, a strongly pointed woody process generally originating from the wood-tissue. Spinescent, terminating in, or resembling. a spine like sharp point; also becoming spinous. Spinelly also becoming spinous.

nose, spinous, furnished with, or of the nature of. spines.

Spore, a minute unicellular body which detaches at maturity and performs, practically speaking, the same function in Cryptogams as the seed in Phanerogams.

Stamen, the male organ of a flower, consisting of a filament and an anther. Staminode, an alortive or antherless stamen. Standard, the posterior or odd petal of a papilionaceous corolla. Stellate, star-shaped; with radiating rays like the points of a star.

Stigma, that part of the pistil which receives the pollen for the fertilization of the ovules.

Stigmatic, relating to the stigma. Stigmatose, resembling or of the nature of the stigma.

Stipe, any stalk-like support; the stalk of an ovary above the floral whorls. Syn. synophore. Stipitate, having a stipe.

Stipule, an appendage of a leaf, usually one on either side of the petiole. Stipulate, having stipules. Stipel, a scondary stipule, the appendage of a leaflet. Stipellate, having stipels.

Stomata, pl. of Stoma, openings in the epidermis of plants with adaptations for regulating the passage of air and moisture.

Stone, the hard endocarp of a drupe. Syn. Putamen.

Striate, marked with thin longitudinal lines or minute furrows.

Strigose, covered with sharppointed straight stiff hairs of unequal length lying close along the surface, and all in the same direction. Style, a stalk proceeding from the submit of the overy and supporting the stigma.

Subulate, shaped like a cobbler's awl; narrow, tapering and

somewhat stiff.

Superior, inserted on the ovary or adnate to it, if said of the calyx; above the calyx and free from it. if said of the ovary; also posterior in position.

Superposed, placed one above

other.

Suture, a seam indicating the line of union of two parts; a line of opening.

Symmetrical, said of a flower having the same number of members in each whorl.

Syncarpous, composed of two or more combined carpels.

Syngenesious, said of stamens united by their anthers, as in Composites.

Tap-root, primary root resulting from the direct prolongation of the radicle.

Tendril, a slender process usually belonging to the axis and serving as a support in climbing.

Terete, cylindrical, rounded in cross section.

Ternate, arranged in threes in a cluster or whorl.

Testa, the outermost cout of a seed.
Tetramerous, said of a flower
having the parts or members
in each whorl in fours.

Tetrandrous, with four stamens. Thalamus, that part of the axis of a flower which supports the floral whorls and the pistil. Syn. torus, receptacle. Thyrsus or thyrse, a panicle, ovate or lanceolate in outline usually with cymose branches. Thyrsiform, of the shape of a thyrsus. Thyrsoid somewhat like a thyrsus.

Tissue, an aggregation of cells indicating differentiation from surrounding aggregations.

Tomentose, covered with hairs which are very short, soft, rather dense and more or less intricate.

Torulose, cylindrical with contractions at regular intervals.

Torus, same as receptacle or thalamus.

Tribe, a division of a Family, comprising a number of closely related genera.

Trichotomous, with the divisions always in threes and of more or less the same length.

Trimerous, said of a flower having the parts or members in each whorl in threes.

Trimorphic, having three forms of hermaphrodite flowers produced by the same species, but generally on different individuals. See dimorphic.

Triplinerved, with a strong secondary nerve on either side of the midrib proceeding from near the base.

Triquetrous, sharply three-cornered.
Tristichous, in three vertical rows.
Truncate, ending abruptly, as if with the end cut off.

Tuber, a thickened underground stem bearing buds or 'eyes.' Tuberous, swollen like a tuber.

Tumid, swollen.

Turbinate, top-shaped; like an inverted cone.

Turgid, swollen and more or less firm.

Umbel, a form of indefinite inflorescence in which several branches or pedicels radiate from the top of a common peduncle and are of nearly the same length.

Undulate, with a wavy margin. Unicellular, formed of, or consisting of, only one cell.

Unisexual, of one sex; having the stamens and the pistil in separate flowers.

Urceolate, urn-shaped; tubular and contracted at or below the mouth.

Utricle, a 1-celled 1-seeded fruit with a thin and more or less loose pericarp.

Valvate, with the margins of the members of a whorl only meeting without overlapping. Also dehiseing by valves.

Variety, a group of individuals differing from others of the same species in certain striking particulars which, however, are not of a nature to justify specific rank; sub-divisions of a species.

Venation, the mode in which

the veins are disposed in a leaf.

Ventral, relating to, inserted on, or opening by, the inner suture of a carpel.

Ventricle, a lateral swelling or bulging out. Ventricose, having a ventricle; unequally swellen.

Verrucose, covered with wart-

Versatile, swinging to and fro; said of an anther attached by the back to the top of the filament.

Verticillate, arranged in whorls.
Villous, more or less thickly
covered with long soft simple
hairs.

Viviparous, said of plants the seeds of which germinate before falling; also sometimes of such seeds.

Whorl, a collective name for all similar members that are arranged in a circle round an axis.

Wing, any thin membranous appendage. Wings, the side petals of a papilionaceous corolla.

Xylem, woody tissue which is formed by the inner portion of a fibrovageular bundle.

FOREST FLORA OF THE SIWALIK AND JAUNSAR FOREST DIVISIONS.

VEGETABLE KINGDOM.

Seed-bearing plants. Fertilization effected by pollen tubes . Ovules in closed ovary, fertilized through stigma. Cotyledons two: radicle elongated to form the primary root . Calvx and corolla both present.1 Corolla of distinct petals 2 . Calyx of distinct sepals 3: petals hypogynous. Torus small or elongated, not expanded Torus thickened or expanded into a fleshy disk 4 . Calvx of combined sepals; disk thin; petals and stamens inserted on the calvx . Corolla of combined petals Perianth single (and generally calvcine), or none 6 Cotyledon one; radicle not elongated to form the primary root Ovules exposed, fertilized by direct contact with pollen tubes Spore-bearing plants. Fertilization not effected by pollen-tubes

I. PHANEROGAMS.

- A. ANGIOSPERMS.
 - a. DICOTYLEDONS.
 - i. POLYPETALÆ.
 - 1. Thalamiflorm
 - 2. Disciflora.
 - 3. Calyciflors. ii. GAMOPETALÆ.
 - iii. APETALÆ.
 - b. MONOCOTYLEDONS.
- B. GYMMNOSPERMS

II. CRYPTOGAMS.

MIROSEM OF LISTURIANDES COMDINED IN DIFFEROMERACES; MALVACES and STEEDULIAGES EMONG the THALAMIFLORE and in Burseraces, Meliaces, SAPINDACES and some RUTACES; RHANKACES and AQUIFOLIACES among the DISCIPLORAL.

* Exceptions.—Disk obsolete in Aquif MAISE, obscure in Linauez and MAISESTATE and wanting in CORLARIACE E.

* Exceptions.—Petats free in some MYSINAGER and STYRAGER.

* Exceptions.—A few plants of Family EUPHOBIACER and the female flowers of Genus Jaysless of Family JULIANDACER have both cally and corolla, and the perinash is double in Genus Loventhus of Lorentziacer.

* The ONYPTOGAMS are not treated of in this Flora.

¹ Exceptions.—Petals wanting in some RANUNCULACEE, BIXACEE and STEE-CULIACEE among the THLAMIFLORE; in some RUTACEE, CELASTRACEE and RHAMAGEE among the DISCIFLORE; and in a few COMBRETACEE, MYRTACEE and SAMTHORES among the CALVCIFLORE.

3 Exceptions.—Petals more or less combined in some TAMARICACEE and TERRISTREMIACEE among the THALAMIFLORE; in some OLACACEE; AQUI-FOLIACEE and VITACEE among the DISCIFLORE; and in Sub-Family MIMOSEE of LEGUMINOSE among the CALVCIFLORE.

3 Exceptions.—Sepals combined in DISCIFLORE.

A. ANGIOSPERMS .--

a. DICOTYLEDONS .-

i. POLYPETALÆ.-

I. Thalamifloræ.

1. 1 11414111110140
Stamens indefinite.
Carpels more or less distinct or solitary 1;
stamens free.
Herbs or soft-wooded climbing shrubs 1. RANUNCULACE E.
Generally trees or woody shrubs,
rarely climbing (e.g., Schizandra
of Order 3).
Sepals and petals usually 5, each in a
single whorl, the former persistent 2. DILLENIACE E.
Sepals and petals in threes, the
latter in several whorls, both
deciduous.
Stipules convolute; albumen even. 3 Magnoliace E.
Stipules 0; albumen ruminate . 4. Anonaceæ.
Carpels combined.
Calyx-lobes imbricate in bud.
Lvs. opposite, gland-dotted; stamens
3-or 5-adelphous 11. HYPERICACEÆ.
Lys. alternate, not dotted; stamens
usually free.
Placentas axile 12 TERNSTRŒMIACEÆ.
Placentes narietal
Ovary long-stipitate; seeds ex- albuminous 7. CAPPARIDACEA.
albuminous . 7. CAPPARIDACEÆ.
Ovary sessile; seeds albuminous 8. BIXACEA.
Calyx lobes valvate in bud.
Calyx irregular, adnate to the ovary,
lobes enlarged in fruit . 13. DIPTEROCARPACE M.
Calyx regular, free, lobes not enlarged.
Stamens monadelphous.
Anthers 1-celled 14. MAT.VACEE
Anthers 1-celled 14. Malvaceæ. Anthers 2-celled 15. Sterculiaceæ.
Stamens distinct; anthers 2-celled . 16. TILIACEÆ.
Stamens few.—never more than 10.
(Carpels more or less distinct in fruit.)
Flowers 3-merous.
Flowers minute; seeds curved . 5. MENISPERMACEE. Flowers conspicuous; seeds not curved 6. Berberidacee.
Flowers 5-merous.
Leaves fairly large: seeds not winged 9. Purrosport on F
Leaves minute (scale-like); seeds
winged 10. Tamaricace ze.

Carpels combined in Genus Anona of Family Anonaces.
 Stipules absent in Genus Schizandra.

A. ANGIOSPERMS. _

a. DICOTYLEDONS .-

i. POLYPETALÆ. -

2. Discifloræ.

Placentas axile; fruit not elongated. Styles 1-5, quite free; filaments often connate at the base. Leaves alternate; fruit not winged . 17. LINACEÆ. Leaves opposite; fruit winged . 18. MALPIGHIACEÆ. Styles more or less combined or solitary; stamens generally free. Flowers symmetrical.
Calyx imbricate. Torus elongated in fr. below the ovary.
Lvs. dotted, aromatic; carpels com-
bined (except in Zanthaxylum) 19. RUTACEE. Lvs. not dotted, bitter or astringent:
carpels distinct.
Lvs. alternate; stem terete . 20. SIMARUBACEÆ.
Lvs. opposite; stem 4-angular . 31. CORIARIACEÆ. Torus not clongated below the ovary.
Plants resinous.
Lvs. dotted; fruit usually with
more than one seed 21. BURSERACE #
Lvs. not dotted; fruit 1-seeded
(except in Spondias) 30. ANACARDIACEA. Plants not resinous.
Stamens opposite to the petals . 29. Sabiace æ.
Stamens alternating with the
petals. Disk obsolete
Disk obsolcte
Calyx valvate.
(Disk prominent; stamens opposite
to the petals.)
Wood usually hard and close-grain-
ed, joints not swollen 26. RHAMNACEÆ.
Wood always soft and porous, joints swollen
Flowers not symmetrical (except in Sta-
phylea), calyx imbricate 28. SAPINDACE E.
Style solitary; stamens monadelphous (ex-
cept in Cedrela); flowers symmetrical;
calyx imbricate
Placentas free-central; fruit not elongated . 28. OLACACE E.
Placentas parietal; fruit a 3-valved elongated

A ANGIOSPERMS .-

a. DICOTYLEDONS .-

i. POLYPETALÆ.-

3. Calycifloræ.

Calyx inferior, free 1; leaves with or without stipules. Leaves stipulate. Carpels distinct or solitary 2. Fruit, a pod; calyx with the odd lobe inferior, i.e., anterior . 38. LEGOMINOSÆ. Fruit various, not a pod; calyx with the odd lobe superior, i.e., . 34. BOSACEÆ. posterior . Carpels more or less combined. . 41. Samydaceæ. . 36. Rhizophoraceæ. Leaves alternate, usually dotted Leaves opposite, not dotted Leaves exstipulate; carpels combined . 40. LYTHRACE A. Calvx superior or more or less adnate to the ovary ; leaves exstipulate. Style simple. Connective of anthers without any appendage. . 38. MYRTACEÆ. Leaves aromatic, gland-dotted Leaves not aromatic, not dotted. Ovary 1-celled; fruit angled or winged 37. COMBRETACEÆ. Ovary 1-4-celled; fruit not angled or winged 43. CORNACEÆ. Connective of anthers tubercled or spurred. . 39. MELASTOMACEÆ. Styles 2 or more. Stamens usually 103; ovules numerous in each cell . 35. SAXIFRAGACEÆ. Stamens rarely more than 5; ovule solitary in each cell 42. ARALIACEÆ.

[:] Calyx ultimately superior and adnate to the ovary in Rosa, Pyrus, Cratægus and Cotoneaster of Family ROSACEE.

² Carpels combined in Pyrus, Cratægus and Cotoneaster of Family Rosacex.

³ Excepting Itea and Ribes which have 4-5 stamens.

A. ANGIOSPERMS. a. DICOTYLEDONS .-ii. GAMOPETALÆ Ovary inferior or adnate to the calux-Ser. 1. EPIGYNÆ. Ovary usually with more than 1 cell: anthers not united. Lvs. opposite: stamens 4-5. Lvs. usually exstipulate . 44. CAPRIFOLIACEÆ. Lvs. always stipulate (unless whorled) . 45. RUBIACEAE. Lvs. alternate, (exstip.); stamens 8 or more 51. STYRACE E. . 46. COMPOSITAL Ovary 1-celled: anthers united . Ovary superior or free.1-Ser. 2. HYPOGYNÆ. Leaves alternate. Stamens inserted on the receptacle. . 47. ERICACEÆ. Anthers opening at the apex . Anthers opening inwards . 50. EBENACEÆ. Stamens inserted on the corolla. Ovules indefinite; inforescence often extra-axillary . 58. SOLANACEZE. Ovules definite: inflorescence axillary (often terminal in Order 56). Lvs. dotted; juice not milky . 48. MYRSINACEÆ. Lys. not dotted : juice often milky Prostrate or climbing plants . . 57. CONVOLVULACEAR. Large erect shrubs or trees . 49. SAPOTACEÆ . 56. BORAGINACEÆ. Lvs. not dotted : juice not milkv Leaves opposite.2 Flowers regular; ovary of 2 carpels. Stamens 2 . 52. OLEACEÆ. Stamens 5. Juice generally milky. Filaments united into a tube, anthers adnate to the stigma . 54. ASCLEPIADACEÆ. Filaments free, anthers not adnate to the stigma . 53. APOCYNACEAS. Stamens 4 or 5. Juice not milky . 55. LOGANIACEÆ. Flowers irregular; ovary of 2 to 4 carpels. Fruit elongated, seeds winged . 59. BIGNONIACEÆ. Fruit not elongated, seeds not winged. Bracts conspicuous; stem with swollen joints 60. ACANTHACE #. Bracts minute or absent; joints of

stem not swollen.

Ovary entire, style terminal

Ovary 4-lobed, style gynobasic , 62! LABIATE.

. 61. VERBENACEÆ

¹ Ovary half-inferior in Masa, Family MYRSINACEE.

Leaves alternate in Jasminum humile, Family OLBACE E.

A. ANGIOSPERMS .-

a. DICOTYLEDONS .-

iii. APETALÆ. Flowers 2-sexual.1 Ovary superior, 1-celled. Stamens opening by valves. (Aromatic plants) . 65. LAURACEÆ. Stamens opening by longitudinal slits. Flowers bracteate. Leaves stipulate. Plants prostrate 64. PIPERACEÆ. or climbing, aromatic Leaves exstipulate. Plants usually herbaceous, not aromatic . 63. AMARANTACE ... Flowers ebracteate 2. Plants covered with silvery scales 67. ELEAGNACEE. Plants not covered with silvery . 66. THYMELEACEÆ. scales Ovary inferior, 1-celled. Plants parasitic on stems; ovule . 68. LORANTHACEÆ. solitary, erect . (Loranthus) Plants often parasitic on roots; ovules . 69. SANTALACEÆ. 2-5. pendulous . Flowers 1-sexual. Flowers not in catkins or spikes (except in Morus, URTICACEM). Ovary 1-celled, 1-oyuled. Leaves opposite and exstipulate, or 0; ovary inferior. Parasitic plants . 68. LORANTHACE E. Leaves usually alternate, stipulate; ovary superior. Not parasitie . 71. URTICACEE. Ovary 3-celled with 1 or 2 ovules in each cell, superior . 70. EUPHORBIACEÆ. Male (sometimes also female) flowers in catkins or spikes. Leaves simple, exstipulate; ovary 72. MYRICACEÆ. superior Leaves pinnate, exstipulate; (flowers monocious); ovary inferior. . 74. JUGLANDACEÆ. Leaves simple, stipulate. Flowers dicecious; ovary superior; seeds hairy . 73. SALICACEÆ. Flowers monocious; ovary inferior; seeds not hairy . 75. FAGACEÆ.

Flowers 1-sexual and dioscious in Piper, Family PIPERACEÆ, and in Litsæa, Family LAURACEÆ.
 Flowers bracteate in Daphne cannabina, Family THYMELÆACEÆ.

A. ANGIOSPERMS .--

b. MONOCOTYLEDONS.

Flowers with a coloured perianth, solitary umbelled or racemed; fruit a capsule or a berry.—Sub-class i, PETALOIDEÆ.

Flowers irregular; ovary inferior . . . 76. SCITAMINEÆ, Flowers regular; ovary superior . . . 77. LILIACEÆ.

Flowers not coloured, arranged in a spadix; fruit a berry or a drupe.—
Sub-class ii. SPADICIFLORE.

Perianth biseriately 6-lobed; plants usually woody . . 78. PALME. Perianth none or rudimentary; plants

Inflorescence inside a spathe; leaves usually long petioled and broad . 80. ARACEÆ.

Flowers glumaceous, arranged in spikelets; fruit a caryopsis.—Sub-class iii. GLUMIFLORÆ.

Sheath of leaf entire; stem 3-quetrous; flower subtended by a single glume 81. CYPERACEE.

Sheath of leaf usually split: stem terete;
flower subtended by several glumes 82. Gramines.

B. GYMNOSPERMS .-

Branches articulate; leaves opposite, rudimentary or broad . 83. GNETACEÆ. Branches not articulate; leaves alternate or fascicled, usually acicular or linear . 84. CONIFERÆ.

ANALYTICAL SYNOPSIS OF THE ORDERS AND FAMILIES.

I. PHANEROGAMS.

Plants representing the greatest morphological differentiation and generally the highest vegetative development, and producing seeds, as distinct from spores, for the purpose of reproduction.

A. ANGIOSPERMS.

Plants representing the highest evolution of the flower. Anthers borne normally on well-developed filaments. Ovary closed, crowned by a stigma which is in most cases borne by a style. Fertilization is effected by the pollen-tubes reaching the egg-cell of the ovule after penetrating the stigmatic tissue.

a. DICOTYLEDONS.

Plants with roots which usually branch from the prolongation of the radicle; wood and bark separated by a cambium layer. Leaves reticulately veined. Flowers usually 4- or 5-merous. Embryo with two cotyledons.

i. POLYPETALÆ.

Flowers with both calyx and corolla, the latter of distinct petals.

I. THALAMIFLORÆ.

Torus not expanded. Flowers generally regular. Calyx inferior, usually of distinct sepals. Corolla hypogynous, usually of distinct p.tals. Stamens hypogynous. Ovary superior.

Order 1. Ranales.

Flowers usually regular, sometimes apetalous. Stamens generally indefinite. Ovary appearance, Seeds albuminous.

- 1. Ranunculacess. Generally erect herbs (rarely climbing shrubs) Sepals deciduous, often petaloid. Petals sometimes wanting. Stamens indefinite. Carpets numerous, usually free.
- 2. **Dilleniacess.** Usually trees or shrubs. *Leaves* alternate, simple, exstipulate. *Sepals* 5, ficshy, imbricate; persistent. *Petals* 5, caducous: *Stamens* ndefinite, in many series. *Seeds* usually arillate.
- ✓ 3. Magnoliacese. Trees or shrubs. Leaves alternate, simple, generally with convolute deciduous stipules. Sepals and petals slike, in whorls of three, imbricate, deciduous. Stamens indefinite, free or monadelphous. Carpels numerous, usually on an elongated torus. Albumen uniform.
- ✓ 4. Anonacese. Trees or shrubs. Leaves alternate, simple, exstipulate. Plowers 3-merous. Sepals 3, valvate. Petals fleshy, valvate, usually in two 3-merous series. Stamens usually indefinite. Abumen ruminated.
- 5. Menispermaces. Generally climbing shrubs. Leaves alternate, exetipulate. Flowers trimerous, small, usually 1-sexual and diocious. Sigmens generally 6 in two series, opposite to the petals. Carpels usually 3: style usually lateral in fruit. Seed croscent-shaped. Albumen even or runninated.
- 6. Berberidacése. Leaves alternate or fascicled, glabrous. Sepals and petals alike, generally 3-merous, caducous. Stamens opposite to the petals; anthers opening usually by valves. Fruit usually of one carpel. Seeds not curved.

Order 2. Parietales.

Leaves usually alternate. Flowers with both sepals and petals. Ovary syncarpous, 1-2- or more-celled; ovules numerous. Plucentation parietal.

- 7. Capparidaces. Flowers 4-merous, often irregular. Stamens 4-8, or numerous. Overy 1-celled; usually long-stipitate. Seeds exalbuminous.
- 8. Bixaces. Leaves simple. Flowers regular, sometimes unisexual. Sepals' 4-5. Patals 4-5; or 0. Stamens numerous. Overy normally 1-celled. Seeds albuminous.

Order 3. Ploygales.

Leaves alternate, simple, entire. Calyx and Corolla both present. Stamens not indefinite. Ovary syncarpous. Placentation usually axile.

9. Pittosporaces. Shrubs or small trees. Leaves simple, entire, exstipulate. Flowers regular, 5-mercus. Stamens 5, alternating with the petals. Overy normally 1-celled. Fruit a 2-valved capsule. Seeds albuminous.

Order 4. Caryophyllales.

Leaves simple, opposite or alternate. Flowers generally 5-merous Calyx often games epalous. Stamens usually definite. Ovary 1-celled Placenta central, ultimately free. Seeds usually albuminous.

10. Tamaricaces. Shrubs or small trees. Leaves alternate, reduced to minute scales. Flowers regular, generally 5-merous. Sepale and petals imbricate, free or connate below. Stamens 5 or 10, rarely 4 or 8; anthers versatile. Fruit a capsule. Seeds hairy or winged.

Order 5. Guttiferales.

Generally erect shrubs or trees. Leaves sin ple. Flowers regular, 2-sexual, generally 5-merous. Calyx imbricate. Stamens usually indefinite. Ovary syncarpous. Placenta axile. Seeds exalbuminous.

- 11. Hypericacese. Erect shrubs. Leaves opposite, exstipulate, generally gland-dotted. Sepals and petals 5. Stamens indefinite, 3-5-adelphous. Fruit a capsule. Seeds numerous.
- 12. Ternstrosmiacess. Shrubs, rarely climbing, or trees. Leaves alternate, exstipulate. Sepals 5, imbricate. Petals 5, often more or less united at the base. Filaments often connate or adnate to the base of the corolla. Overy 3-5-celled.
- \checkmark 13. **Dipterocarpaceæ.** Resinous trees. Leaves alternate; stipules generally inconspicuous and early caducous. Sepals 5, connate in flower, persistent, 2 or more accrescent in fruit. Petals 5, twisted. Stamens numerous (in Shorea); anthers with an aristate connective. Fruit indehiscent, 1-seeded, generally winged with enlarged calyx-lobes. Cotyledons fleshy.

Order 6. Malvales.

Usually erect shrubs or herbs, or trees, with mucilaginous and fibrous bark. Leaves alternate, simple palmately lobed or digitate, stipulate, usually stellately hirsute. Flowers regular, generally 2-sexual, often bracteate. Sepals 5, valvate. Petals 5, rarely 4. Stamens usually many. Ovary generally syncarpous, sometimes stipitate. Albumen scanty or 0.

- 14. Malvacese. Young parts usually stellate-hairy. Flowers supported by bracteoles which generally form an epicalyx. Petale twistedly imbricate. Stamens 1-adelphous, rarely 5-adelphous; anthers 1-celled. Carpels usually many; styles more or less connate.
- 15. Sterculiacese. Young parts more or less pubescent. Flowers sometimes 1-sexual. Sepals 5, valvate, more or less connate. Petals 5, connate at the base or 0. Filaments monadelphous with 5-many 2-celled extrorse anthers. Obary stipitate or sessile; syncarpous or apocarpous. Fruit a capsule or of distinct follicles.
- √16. Tiliaces. Sepals 3-5, free or connate; valvate. Petals 3-5, usually free rarely absent. Stamens indefinite, distinct; anthers 2-celled, introrse. Ovary free, 2-10-celled. Fruit a drupe or a capsule.

2. DISCIFLORÆ.

Torus generally expanded into a fleshy disk between the petals and the ovary. Sepals distinct or connate, generally small. Petals distinct or more or less coherent at the bess or at the apex as in some VITACE................................, inserted on or cutside the hypogynous disk. Ovary superior.

Order 1. Geraniales.

Flowers usually 5-morous. Stamens generally twice the number of petals. Disk sometimes wanting. Ovules 1 or 2 in each cell, pendulous; raphe ventral.

- * Leaves simple, generally stipulate. Flowers regular or irregular.
- 17. Linacese. Leaves alternate, usually entire. Flowers regular, 2-sexual. Sepals entire, imbricate. Petals contorted in bud, each with a gland at the base, representing the disk. Samens 5 and alternating with as many staminodes, or 10, adnate to the glands of the disk; anthers versatile. Ovary 3-5-celled; styles 3-5. Fruit a capsule. Seeds often albuminous.
- 18. **Malpighiacess.** Usually climbing shrubs. Leaves opposite, generally exstipulate. Flowers 2-sexual, often irregular. Calys 5-partite, usually with a large gland outside. Petals 5, im¹ ricate. Disk obscure. Ovary 3-celled; styles 1-3. Fruit of 1-3 samaras. Seeds exalbuminous.
 - Leaves pinnately compound, generally exstipulate. Flowers regular.
- 19. Rutacese. Leaves usually alternate, pellucid-punctate. Calyx small, of 4-5 imbricate lobes. Petals 4-5, generally imbricate. Stamens up to 10, rarely nore. Disk annular or cylindical, within the stamens. Ovary of 4-5 free or connate carpels; styles 1-5. Fruit various.
- 20. Simarubaces. Trees or erect shrubs with bitter bark. Leaves alternate. Flowers usually 1-sexual. Calyx small; 3-5 lobed. Petals valvate or imbricate. Stamens up to 10, inserted at the base of the disk. Ovary often deeply lobed. Fruit drupaceous or samaroid. Seeds usually albuminous.
- 21. Burseracese. Resinous trees or erect shrubs. Leaves alternate. Flowers 2-sexual or polygamous. Calyz 3-7-lobed: often minute. Petals 3-7. imbricate or valvate. Disk annular or cupular. Stamens up to 10, inserted at the base or on the margin of the disk. Ovary 2-5-celled; style simple. Fruit a drupe. Seeds exalbuminous.
- 22. Meliaces. Mostly trees. Leaves alternate. Flowers generally 2-sexual. Calyz 3-6-lobed. Petals 3-6, generally imbridate. Stamens up to 12; filaments usually connate into a tube. Disk hypogynous, inside the staminal tube. Ovary 2-5-celled; style single. Fruit various. Seeds albuminous in the local species.

Order 2. Olacales.

Leaves simple, usually alternate; stipules 0 or inconspicuous. Flowers regular, often 1-sexual, usually 5-merous. Calyx generally

persistent. Filaments more or less connate, often adnate to the retals. Disk sometimes wanting. Style simple or 0. Ovules pendulous; raphe dorsal. Fruit drupaceous. Seeds albuminous.

- 23. Olacacoco. Leaves exstipulate. Petals valvate. Disk cup-shaped. Fertile stamens 3-5. Ovary spuriously 3-5-celled; placenta central. Fruil 1-celled 1-seeded.
- 24. Aquifoliacese. Leaves alternate; stipules minute and caducous. Flowers usually 1-sexual, often diœcious; sepals and petals more or less connate at the base. Filaments subulate, generally free in the female or 2-sexual flowers, adnate to the base of the corolla in male flowers. Disk 0. Style short or 0. Fruit a drupe with 2 or more stones.

Order 3. Celastrales.

Trees or shrubs. Leaves mostly simple, stipulate. Flowers regular, 4-5-merous, cymose. Stamens as many as petals. Desk conspicuous. Ovary 2-6-celled, sometimes sunk in the disk; style simple, parely 0. Ovules erect; raphe ventral. Seeds usually albuminous.

- √25. Celastracese. Leaves opposite or alternate. Flowers 2-sevual or polygamous. Calyz imbricate, persistent. Petals imbricate, often 0. Stamens alternating with the petals or (if petals 0) opposite to the calya-lobes. 2 in each cell. Seeds mostly arillate, sometimes winged.
- 26. Rhamnaces. Leaves generally alternate; stipules sometimes turned into prickles. Flowers small, greenish or pale. Calyx sometimes superior; tobes valvate, triangular. Petals generally involute, usually shorter than the calyx-lobes, sometimes 0. Disk fleshy. Stamens opposite to the petals or (when petals 0) alternating with the calyx-lobes; anthers versatile. Ovary usually 3-celled, with 1 ovule in each cell.
- 27. Vitacese. Mostly cirrhose climbing shrubs. Leaves alternate, simple or variously compound. Flowers usually 2-se ual. Calyx-lobes and petals valvate, the latter often cohering and caducous. Disk fleshy. Stamens opposite to the petals; filaments subulate; anthers introrse. Style short or 0. Orules 1-2 in each cell. Fruit a berry.

Order 4. Sapindales.

Generally erect shrubs or trees. Leaves alternate (except in Acer, Staphylea and Coriaria) and exstipulate (except in Staphylea). Flowers regular or irregular, sometimes 1-sexual. Calyx-lobes imbricate. Petals free. Stamens free, generally some wanting or barren. Disk present (except in Coriaria). Ovules ascending or pendulous from an erect funicle; raphe ventral. Seeds generally exalbuminous.

28. Sapindacese. Flowers often irregular. Petals 4-5, sometimes 0. Disk complete or one-sided. Stamens hypogynous, generally 8. Ovary generally 8 celled, sometimes eccentric; style usually terminal. Seeds sometimes arillate, usually with a large hilum.

29. Sabiacese. Flowers generally small, usually 2-sexual. Petals often unequal. Disk small, annular. Stamens opposite to the petals; sometimes unequal addition only 2 or 3 perfect. Seeds with a broad hilum, sometimes compressed.

√80. Anacardiacese. Trees or shrubs, usually resinous. Flowers regular, small. Petals free. Ditk annular. Stamens sometimes not all perfect, Overy 1-celled. Fruit usually a 1-seeded drupe.

31. Coriariacese. Erect shrubs with quadrangular branches. Leaves opposite or whorled, simple. Flowers regular, 2-sexual. Sepals 5, spreading. Petals 5, keeled, accrescent in fruit. Disk 0. Stamens 10; anthers exserted. Carpels usually 5, free, embraced by the fleshy petals.

32. Moringacese. Trees with soft wood. Leaves 2-or 3-pinnate, glandular at the base. Flowers irregular, 2-sexual. Calya petaloid, segments deciduous. Petals 5, unequal. Disk lining the calyx-tube. Stamens on the edge of the disk, declinate, 5 fertile and opposite to the petals alternating with 5 antherless filaments. Ovary stalked, 1-celled; ovules on 3 parietal placentas. Fruit a pod-like 3-angled loculicidal capsule. Seeds usually winged.

3, CALYOIFLORÆ.

Calyx gamosepalous. Disk thin, often lining the calyx-tube. Petals and stamens inserted on the calyx or on the disk when it is adnate to the ca'yx. Ovary superior or inferior.

Order 1. Rosales.

Leaves generally alternate, stipulate (Leguminosæ and Rosaceæ) or exstipulate (Saxifragaceæ, etc.). Ovary of one or more free or conmate carpels; styles usually as many as carpels. Seeds generally exalbuminous in the first two Families, albuminous in the others.

33 Leguminos. Leaves alternate; stipulate, usually compound. Flowers bexual, generally irregular. Calya often 2-lipped with the odd lobe inferior. Pstals normally 5, usually tree, sometimes very unequal. Stamens normally 10 and declinate, or numerous and straight. Ovary quite free, 1-celled ovules one or more on the ventral suture. Fruit a 1-many-seeded pod. Seeds exalbuminous except inpome Comadpinates.

34. Rosacow. I caves alternate, stipulate, simple or compound. Plocers regular, usually 2-sexual. Calyx with the odd lobe superior. Stamens many, that not. Ovary of 1 or more free or connate carpels: ovules not more than 2 in each carpel. Fruit various, but never a pod or a berry, usually 1-seeded.

35. Saxifragacese. Herbs or shrubs. Leaves opposite or alternate, simple, exstipulate. Flowers regular; generally 2-sexual. Calyx more or less adnate to the ovary. Petals 5, rarely 4 or 0. Stamens 5, or 10, or numerous. Ovary 2-5-celled; styles as many as the carpels. Fruit a berry or a capsule. Seeds many, albuminous.

✓Order 2. Myrtales.

Leaves simple, generally exstipulate. Flowers regular, usually 2-sexual. Stamens at least twice the number of petals. Overy

generally inferior; style 1; ovules as a rule pendulous. Seeds exalbuminous (in the local Families).

- 36. Rhizophoraces. Leaves opposite, with caducous stipules. Flowers 2-sexual. Calyx 4-14-toothed. Petals as many as the calyx-teeth. Stamens 2-4-times the number of petals. Ovary 5-1-celled; ovules 2 in each cell, pendulous. Fruit 1-celled. 1-seeded.
- 37. Combretacese. Leanes opposite or alternate, exstipulate. Flowers rarely 1-sexual. Calya-lobes 4-5, valvate. Petals 4-5 or 0. Stamens as many or twice as many as the potals. Ovary 1-celled; ovules pendulus. Fruit usually a 1-segded drupe.
- 33. Myrtacess. Leaves typically opposite and then giand-dotted. Calyx-limb short, 4-5 toothed or entire. Petals generally 4, free or united in a calyptra. Stawen; indefinite; anthers often versatile. Ovary 1-many-celled, with one, few or many ovules. Seeds generally angular.
- 39. Melastomacee. Leaves opposite or whorled, entire, 3-7-nerved from the base. Flowers generally showy; 2-sexual. Calyx-tube constricted above, limb 3-5-lobed. Petals 3-5, twisted in bud. Stamens 4-10: anthers usually opening by pores; connective tubercled or spurred. Ovary 3-5-celled; ovules many; style simple. Frust a many-seeded capsule.
- 46. Lythracess. Leaves entire, generally opposite, exstipulate. Flowers 2-sexual Calya inferior (except in Punica), lobes 3-6; valvate. Patale as many as easily-closes or 0. Stamens definite or indefinite. Ocary superior (except in Punica); style simple, persistent; ovules many on an axile placents. Fruit a capsule; seeds numerous.

Order 3. Passiflorales.

Mostly herbaceous plants. Leaves alternate, simple, often lobed, stipulate. Flowers regular, 2-sexual or 1-sexual, showy except in Samydacee. Ovary superior or inferior, 1-3-celled, exceptionally 5-celled; style single or 2-4; placentas parietal. Fruit 1-celled. Seeds generally arillate, usually albuminous.

41. Samydacess. Generally trees. Leaves often punctate. Flowers small-Calyz inferior, 4-5-lobed. Petals generally 0. Stamens definite or indefinite, usually united into a hypogynous tube. Ovary superior, 1-celled; style, single, placentas 3. Fruit a capsule. Seeds arillate and albuminous.

Order 4. Umbellales.

Leaves mostly alternate. simple or compound, usually exstipulate. Flowers regular, usually 2-sexual, often in heads or umbels. Calyx-tube adnate to the ovary. Petals 5, rarely more or 0, generally valvate. Disk epigynous, conspications. Ovary inferior, generally 2-celled, with one ovule in each cell; style solitary or as many as the cells. Fruit various. Seeds pendulous, albuminous.

42/Araliacese. Petioles long, usually clasping the stem; stimules adnate to the petiole or 0. Flowers small, 2-sexual or polygamous. Calya-limb short.

truncate or with small teeth. Petals usually 5, normally valvate, deciduous. Stamons as many as the petals, inserted on the disk; anthers versatile. Overy 2 5-celled; styles as many as the cells. Fruit a drupe or a berry.

43. Cormaces. Shrubs or trees. Leaves simple, opposite or alternate, entire.

**Flowers* in heads, cymes or panicles. **Calyx-limb* truncate or with small teeth.

**Petals* 4-5, valvate, or none. **Stamens generally as many as the petals, rarely more. **Opary 1-4-celled; style single. **Fruit usually a succulent drupe.

ii. GAMOPETALÆ.

Flowers usually 2-sexual. Calyx and corolla both present, the latter with the petals more or less connate, rarely completely free. Stamens usually inserted on the corolla.

Series i. EPIGYNÆ.

Stamens epipetalous, alternating with the corolla-lobes. Overw inferior.

Order 1. Rubiales.

Leaves simple, opposite or whorled. Flowers 4-5-merous, generally regular, 2-sexual. Calyx incised. Corolla-tube generally not short. Ovary 2-8-celled; style simple; ovules pendulous. Seeds albuminous.

44. Caprifoliacess. Leaves as a rule exstipulate. Flowers 5-merous, bracteate, in corymbose or panieled cymes, sometimes in pairs; æstivation imbricate. Stamens inserted on the corolla-tube between the lobes; anthers versatile. Dary 1 6-celled; ovuide solitary and pendulous or many on axile placentas.

**The state of the state of the

Order 2. Asterales.

Mostly herbs. Leaves opposite or alternate, generally exstipulate. Flowers usually sessile. Calyx generally inconspicuous. Corolla regular or irregular. Stamens on the corolla-tube. Ovary usually 1-celled, 1-ovuled. Seeds erect and exalbuminous in Composite, pendulous and often albuminous in other Orders.

46. Composites. Herbs or shrubs. Leaves generally alternate, exstipulate. Flowers sessile in heads. Calyx-limb represented by hairs or scales or absent,

Corolla-lobes 5 and valvate in disk-flowers, ligulate in ray-flowers. Disk epigynous. Stamens 4-5, on the corolla-tube; filaments usually free; anthers usually spagenesious. Ovary 1-celled, with one erect ovule; style slender, 2-fid. Fruit a cypsels. Seeds exalbuminous.

Series ii. HYPOGYNÆ.

Stamens epipetalous, or free and hypogynous, 4-5 or more. Ovary superior.

* Carpels more than two. (Leaves simple, generally exstipulate.

Flowers regular.)

Order 3. Ericales.

Leaves alternate, exstipulate. Flowers regular. Stamens usually hypogynous, often twice the number of corolla-lobes; filaments free. Fruit generally a capsule. Seeds many, albuminous.

47. Ericaces. Flowers solitary, fascicled or racemed. Calyx free, usually 5-lobed. Corolla campanulate or urceolate. Stamens generally twice as many as the corolla-lobes; anchers usually opening at top by pores or shits. Ovary 4-5-many-celled; ovules many. Seeds small.

Order 4. Primulales.

Leaves generally alternate, exstipulate. Corolla-tube generally short, or petals almost free. Stamens usually on the corollatube, always opposite to the lobes. Style solitary (except in Plumba-Ginera). Ovary 1-celled; placentation free-sentral. Seeds usually albuminous.

48. Myrsinaces. Leaves alternate, gland-dotted. Flowers small, inflorescence generally axis. Calyx sometimes adnate to the ovary; lobes persistent. Pstals nearly or completely free. Anthers free or united by their margins. Fruit a berry. Seeds generally solitary and excavate at the base.

Order 5. Ebenales.

Trees or shrubs. Leaves alternate, exstipulate. Flowers usually 4-merous. Calyx generally persistent. Corolla-tube short. Stamens epipetalous, as many as the corolla-lobes and opposite to them or 2-3 times as many in several series, sometimes indefinite. Ovary 2-8-celled; ovules 1 or 2 in each cell, generally pendulous. Fruit a drupe or a berry. Seeds generally albaminous.

¹ Not described in this Flora.

- 49. Sapotaces. Young parts rusty-tomentose; juice often milky. Leaves entire, exceptionally with caducous stipules. Calyx-lobes 4-8, the outer whorl valvate. Corolla-lobes 2-24, in two series if more than 14. Stamens as many as the corolla-lobes or numerous in several series; filaments short; anthers extrores with the connective often produced. Ovary usually 6-8-celled, with a solitary anatropous ovule in each cell; style simple. Fruit a berry. Seeds generally albuminous (exaibuminous in Bassia).
- 50. Ebenaces. Leaves exceptionally subopposite, entire. Flowers directious, rarely polygamous. Calyx often accrescent. Corolla-lobes generally twisted. MALE FLS.: stamens 4-16; anthers narrow. FEM. FLS. staminodes 2-10, or 0. Ovary 2-more-celled; ovule generally solitary, anatropous; styles 2-8. Fruit a berry, 1-10-seeded. Seeds with copious albumen.
- 51. Styracess. Leaves alternate, usually serrate or crenate. Flowers 2-sexual, generally white. Calyx adnate to the ovary; limb persistent. Corolla of 4-5 almost free petals. Stamens usually indefinite, attached to the corollatube or base of the petals in one or several series. Ovary half-superior, 2-5-celled; ovules usually 2 in each call, pendulous (in Symplocos). Fruit drupaceous. Seeds albuminous.
 - ** Carpels never exceeding two. (Leaves as a rule exstipulate.)
 - A. Flowers regular. Stamens 2 or 5, rarely 4.

Order 6. Gentianales.

Lervis normally opposite if not whorled. Flowers usually 2-sexual. Stamens between the corolla lobes. Carpels distinct or connate; style generally simple.

- 52. Oleaness. Leaves simple, 3-foliolate or imparipinnate. Calyx 4-5-or more-toothed, or truncate. Corolla-lobes 4-5 or more. Stamens 2, on the corollatube or hypogynous; filaments generally short. Ovary-cells 1-2-ovuled; style simple; stigma simple or 2-lobed. Fruit a capsule, berry or drupe, 2-celled with 1 or 2 seeds in each cell. Seeds albuminous or exalbuminous.
- 53 Apocynaces. Trees or shrubs with milky juice. Leaves opposite or whorled, very rarely alternate, simple, quite entire. Calyx-lobes 5, generally imbricate. Corolla rotate or salver-shaped; lobes twistedly imbricate. Stamens 5, on the corolla-tube, sometimes adherent to the stigma by the connectives; anthers sometimes spurred downwards; pollen granular. Ovary of 2 distinct or connate carpels. Fruit of 2 distinct or connate follicles, or a drupe, or a berry. Seeds usually albuminous, those of follicular fruits usually comose or winged.
 - 54. Asolepiadacese. Herbs or shrubs with milky juice. Leaves opposite, simple; entire, sometimes 0. Calys-lobes 5, imbricate. Corolla-tube short, often with a ring of scales at the mout; lobes valvate or imbricate. Stamens 5, rarely free, generally connate into a fleshy column with the anthers adhering to the stigma by broad connectives; pollen in 1 or 2 granular or waxy masses in each cell at the angles of the stigma. Styles 2, connate; stigma 5-angled. Fruit normally of 2 follicles. Seeds comose at the hilum, albuminous.
 - 55. Loganiaces. Trees, shrubs or herbs. Leaves opposite, simple; stipules obsolete. Flowers 4-5-merous. Stamens on the corolla-tube; filaments distinct. Orules usually many in each cell; style simple. Fruit a berry or a capsule, 1-many-seeded. Seeds albuminous.

Order 7. Polemoniales.

Leaves usually alternate, simple, exstipulate. Flowers 5-merous, usually 2-sexual, generally cymose, often showy. Calyx generally persistent, often accrescent. Stamens 5, on the corollatube, alternating with the corolla-lobes. Style generally simple, terminal or gynobasic.

- 56. Boraginaceæ. Herbs, shrubs or trees. Leaves alternate, sometimes subopposite or opposite. Calyx-lobes valvate. Ovary sometimes spuriously 4-celled; ovules usually 4 altogether: style simple or forked, terminal or gynobasic. Fruit a drupe or of 2-4 nutlets. Seeds erect or oblique.
- 57. Convolvulacess. Herbs or shrubs, usually twining. Leaves alternate, rarely 0. Flowers 2-sexual. Calyx-lobes imbricate. Corolla campanulate or funnel-shaped, often 5-plaited in bud. Ovary son etimes spuriously 4-celled; ovules 2 in each carpel. Style usually simple. Seeds generally exalbuminous; cotyledons plaited or 0 (as in Cuscuta).
- 58. Solanacee. Herbs or shrubs. Leaves alternate. Flowers solitary or in cymes, axillary, extra-axillary or terminal. Corolla rotate or campanulate, often plaited in bud. Ovules many on large peltate placentas. Style simple. Fruit a many-seeded berry or a capsule. Seeds albuminous; embryo curved.
- B. Flowers irregular. Stamens usually 4 (by the suppression of the odd one), often 2 long and 2 short, or only 2. Leaves usually opposite.

Order 8. Personales.

Flowers usually 2-sexual. Corolla generally 2-labiate with the neck of the tube more or less constricted. Stamens epipetalous, 4 with the posterior one abortive, or 2. Carpels 2, median; ovules generally indefinite; style simple. Fruit capsular. Seeds without albumen.

- 59. Bignoniacese. Usually trees. Leaves pinnately compound. Flowers generally in terminal panicles or racemes. Calyx truncate or spathaceous; lobes valvate. Corolla unequally 5-lobed imbricate in bud. Stamens usually 4 and dynamous, rarely 5 and nearly equal. Overy more or less stipitate and supported by an annular dis. Fruit an elongated capsule. Seeds winged.
- oprosite, usually simple. Flowers bracteate and bracteolate. Calya usually 5-partite. Corolla 2-lipped or subequally 5-lobed: lobes imbricate or twisted. Stamens 4 or 2. Ovules 1 or more, superposed in each cell of the ovary; style 2-fld with one arm usually sterile. Fruit a loculicidal capsule. Seeds compressed, usually hairy.

Order 9. Lamiales.

Stem more or less quadrangular. Leaves opposite and decussate. Flowers 5-merous, usually 2-labiate and didynamous. Stamens

epipetalous. Carpels 2, median. Ovary 2-or falsely 4-celled. Fruit with 1-4 seeds.

Verbenacese. Herbs, shrubs or trees. Leaves simple or digitate. Flowers symose and bracteate, rarely regular. Calyz 4-5-toothed, often persistent and accreacent, sometimes coloured. Corolla 2-lipped or more or less equally lobed. Stamene usually 4, one pair longer than the other in 2-labiate flowers, more or less equal in regular flowers. Ovary 2-4-celled, entire; style terminal. Fruit usually a drupe, rarely a capsule. Seeds exalbuminous.

62. Labiatæ. Mostly herbs, rarely shrubs, glandular-hairy and more of less aromatic. Flowers always 2-labiate, in verticelled cymes which are arranged in simple or panicled spikes. Calyx persistent. Stamens 4, one pair longer than the other. Disk prominent. Ovary 4-lobed, 4-celled; style gynobasic. Fruit of 4 1-seeded nutlets.

iii. APETALÆ:

Perianth single and generally calycine, rarely double or none. Flowers in many cases unisexual.

Series 1.—Flowers usually 2-sexual and generally regular. Ovary as a rule 1-celled and 1-ovuled. Leaves simple, generally entire.

* Ovary superior.

Order 1. Chenopodiales.

Generally herbaceous. *Perianth* regular, green or coloured. Style in most cases solitary. *Fruit* as a rule nuf-like. *Embryo* curved.

63. Amarantaces. Leaves generally alternate, exstipulate. Flowers bracteate and bracteolate. Perianth scarious, persistent. Stamens up to 5, opposite the sepals. Fruit usually a utricle (although baccate in the two species described in this Flora). Seed albuminous.

Order 2. Piperales.

Aromatic herbs or shrubs. Flowers usually without a perianth, bracteate, arranged in a spike or a spadix. Ovule orthotropous. Embryo minute, not curved, imbedded in copious albumen.

64. Piperacess. Leaves entire, often punctate. Flowers supported by peltate bracts in catkin-like spikes. Fruit small.

Order 3. Daphnates.

Leaves usually alternate, entire, exstipulate. Flowers regular, mostly 2-sexual, 3-4-5-merous. Stamens typically in two whorls, perigynous. Ovule anatropous. Embryo straight.

- of. Lauracese. Aromatic plants. Perianth usually 3-merous, often persistent; segments imbricate, Stamens perigynous, up to 12 in 3 or 4 series, the innermost series often reduced to staminodes; filaments often with 2 glands at the base; anther-cells opening by deciduous valves. Ovuls pendulous. Seeds pendulous, exalbuminous.
- 66. Thymelseaces. Shrubs or trees with very fine tenacious bast. Leaves alternate or opposite. Flowers 2-sexual; perianth tubular or campanulate; lobes usually 4, imbricate. Stamens epiphyllous, usually twice as many as the corolla-lobes and then in 2 series one above the other. Style long or short or 0 Ovule pendulous. Fruit usually indehiscent. Seeds generally exalbuminous.
- 67. Elseagnaces. Leaves alternate. Flowers 1-2-sexual, generally 2- or 4-merous; perianth tubular, lobes valvate. Stamens 4, epiphyllous. Ovule erect. Fruit indehiscent, enclosed in the accrescent perianth-tube. Albumen scanty or 0.

** Ovary inferior.

Order 4. Santalales.

Generally parasitic shrubs or trees. Leaves in most cases opposite, entire, exstipulate. Stamens as many as the perianth-lobes and inserted on and opposite to them. Ovules without integuments. Fruit 1-seeded, generally drupaceous. Seeds albuminous.

- 68. Loranthacese. Parasitic on branches of trees. Leaves sometimes wanting when the branches are articulate and more or less flattened. Flowers 1-2-sexual; perianth sometimes double, the outer then is short and truncate, and the inner usually long; lobes always valvate. Ovule solitary, erect.
- 69. Santalacese. Parasitic on roots. Leaves opposite or alternate. Flowers energing 2-sexual; sometimes polygamous. Placentation free-central; ovules 1-4, pendulous. Fruit a drupe. Seed solitary.

Series 2.—Flowers 1-sexual. Perianth regular or irregular, sometimes wanting. Ovary 1-6-celled. Leaves mostly simple and alternate.

* Ovary superior.

Order 5. Euphorbiales.

Trees, shrubs or herbs, sometimes with milky juice. Leaves generally simple and stipulate. Perianth usually single, rarely double or none. Ovary as a rule 3-celled with 1 or 2 suspended ovules in each cell; styles as many as the carpels. Fruit various. Seeds albuminous.

70. Euphor biacess. Same characters as of the Order.

Order 6. Urticales.

Leaves simple, stipulate, generally hirsute. Perianth simple, of 3-5 free or connate segments, regular, rarely absent. Stamens usually opposite to the perianth-segments. Ovary usually 1-celled, 1-ovuled; style often eccentric. Fruit various, never a capsule. Seeds with or without albumen.

71. Urticaces. Trees, shrubs or herbs, sometimes with milky juice. **
Edwers monrecious or diocious; perianth always present. Stamens often finflexed in bud with reversed anters. **Embryo straight.**

Order 7. Amentales.

Trees or shrubs. Leaves simple and sometimes reduced to scales. Flowers, both male and female, in catkins or spikes, usually bracteate. Perianth, if present, of 4-6 segments with the stamens inserted on them. Ovary 1-celled; ovules few or numerous. Seeds exalbuminous.

- 72. Myricaces. Leaves exstipulate. Flowers monœcious or diœcious; perianth none. Stamens inserted on bracts. Ovary sessile, of 2 carpels butl-celled, 1-ovuled; style 2-fid. Ovule erect, orthotropous.
- 73. Salicaces. Leaves stipulate; buds enclosed in scales. Flowers diocious, each in the axil of a bract; perianth none. Stamens 2-6 on a glandular disk. Ovary often stipitate, of 2 carpels but 1-celled; style simple or 0. Ovules many; generally on parietal placentas. Fruit a loculicidal capsule. Seeds comose.

** Ovary inferior.

Order 8. Quernales.

Trees or shrubs. Leaves alternate. Flowers monœcious, male in catkins, female solitary or spicate. Perianth green, generally gamophyllous. Ovary 1-6-celled; ovule solitary, pendulous or basal. Seeds without albumen.

- 74. Juglandaces. Leaves imparipinnate, without stipules. Flowers bracteate. Perianth in male flowers flat and adnate to the supporting bract which is stipitate, in the female flowers imperfectly double. Stamens indefinite. Female flowers solitary or spicate. Style 2-fid. Fruit a drupe or nut; cotyledons contorted or corrrugated.
- 75. Fagaces. Leaves simple, stipulate, coriaceous. Flowers generally bracteate. Male perianth with 1-5 segments or wanting female tubular, adnate to the ovary and supported by an involucre of bracts. Overy 3- or 4-5-celled with 1 or 2 pendulous ovules in each cell; style 3-5-armed. Fruit usually a 1-celled nutincluded within; or supported by enlarged bracts. Seeds pendulous

b. MONOCOTYLEDONS.

Roots usually fibrous and often fascicled at the base of the plants. There is no separable bark, and no continuous cambium layer. Leaves sheathing, and usually with parallel veins. Flowers as a rule 3-merous. Embryo with only one cotyledon.

Sub-Class i. PETALOIDEÆ.

Flowers with a coloured perianth, solitary or in umbels or racemes. Fruit a capsule or a berry.

Series 1.—Ovary inferior.

Order 1. Amomales.

Herbaceous plants. Leaves pinnately parallel-veined. Flowers 2-sexual, very irregular. Perianth of 6 segments in two series. Stamens 1 to 5, others reduced to petaloid staminodes. Ovary 3-celled. Fruit a capsule or a berry. Seeds often arillate, albuminous.

76. Scitaminess. Generally the characters of the Cohort. Flowers solitary or in spikes or panicles. Fertile stamen only 1 (except in Musa).

Series 2.—Ovary superior.

Order 2. Liliales.

Herbaceous plants usually with bulbous or creeping root-stocks. Flowers regular. Calyx and corolla similar, both coloured. Fruit a capsule or a berry. Seeds albuminous.

77. Liliacese. Generally the characters of the Cohort. Leaves sometimes more or less net-veined.

Sub-Class ii. SPADICIFLORÆ.

Flowers not coloured, arranged on a more or less fleshy spadix. Ovary superior. Fruit a berry or a drupe. Seeds with copious albumen.

Order 1. Palmales.

Flowers generally 1-sexual, monœcious or diœcious. Stem erect or scandent, sometimes very long. Inflorescence at first enclosed in a coriaceous spathe. Perianth of 2 series, each of 3 coriaceous segments. Stamens 6, on base of the perianth; anthers usually versatile. Ovary 1-3-celled or of 3 distinct carpels; stigmas 3, usually sessile.

78. Palmse. Essential characters as above. Leaves alternate, pinnatisect or palmatilobed, sometimes armed.

Order 2. Arales.

Generally fleshy plants. Flowers small and numerous, usually monœcious, borne on a spadix or a panicle with thick branches, generally enclosed in a much developed spathe. Perianth polyphyllous or wanting. Ovary syncarpous or apocarpous. Embryo minute, straight.

- 79. **Typhaces.** Aquatic herbs. Leaves linear, sessile. Flowers monœcious, minute, densely crowded on bracteate spikes. Male flowers with usually 1 stamen; flament capillary. Overy 1-2-celled. Fruit a minute drupe.
- 80. Araces. Fleshy plants, sometimes scandent. Flowers usually without a perianth. Anthers sessile, 2-4-celled. Ovary sessile, 1-3-celled. Fruit a berry.

Sub-Class iii. GLUMIFLORÆ.

Flowers supported by glumes in variously arranged spikelets.
Fruit a caryopsis. Seeds albuminous.

Order 1. Glumales.

Ovary superior, 1-celled. Ovule erect.

81. Cyperaces. Grass-like herbs, generally with 3-quetrous stems. Leaves tristichous; sheaths entire. Flowers subtended by a single glume. Perienth reduced to bristles or scales, or 0. Stamess 1-3; anthers innate. Style with 2-3 stigmatose branches. Fruit 3-gonous. Embryo central.

82. Graminess. Herbs, shrubs or trees, generally with terete jointed stems. Leaves alternate, usually narrow; sheaths split in front to the base, distinct from the blade, often with a ligule at the apex. Flowers 1-2-sexual, subtended by several distichous imbricate glumes. Pertanth of 2 or 3 minute hypogynous scales (lodicules) or 0. Stamens in most cases 3, rarely 6 or more, hypogynous; anthers versatile. Styles 2-3, stigmatose throughout. Fruit terete or compressed. Embryo basal and generally lateral.

B. GYMNOSPERMS.

Shrubs or trees with separable bark and imperfectly developed unisexual flowers. Anthers usually borne on the back of scales, the filaments not being developed. Ocules are produced in an open ovary formed by a scale, and are fertilized by the direct application of the pollen, the style and stigma being absent. Cotyledons 2 or more.

83. Gnetaces. Trees or shrubs with articulated branches. Leaves opposite, minute or large. Flowers in spikes or cones. Anthers 2-8 on a column of combined filaments. Ovule exposed, erect, one of its coats forming a protruding tube resembling a style. Cotyletons 2.

wood without pores. Generally large evergreen trees with monopodial stems; wood without pores. Leaves alternate or fascided, generally acicular. Flowers generally monocious. Male flowers in deciduous catkins. Female flowers of one or more exposed ovules borne on a carpellary scale, arranged spirally round an axis to form a cone. Seeds usually variously winged. Cotyledons generally more than 2.

DICOTYLEDONS.

THALAMIFLORÆ.

Order 1.—RANALES.

FAM. 1. RANUNCULACEÆ; G. P. N. 1.*

Herbs or climbing shrubs. Leaves alternate, rarely opposite, usually exstipulate, simple much divided or compound. Flowers usually regular, generally ebracteate. Sepals 4-5 or more, usually deciduous, often coloured. Petals 3-5 or more, often minute or deformed, or totally absent. Stamens usually numerous, hypogynous, free. Carpels many or few, free, 1-celled, 1- or more-ovuled. Stigma simple. Fruit either of many achenes, or of follicles, rarely a berry. Seeds albuminous.

1. Clematis, Linn.; G. P. n. 1.*

Climbing shrubs. Leaves opposite, exstipulate, usually compound. Flowers in axillary or terminal fascicles or panicles, rarely solitary. Sepals usually 4, valvate, petaloid. Petals 0. Stamens and carpels indefinite. Fruit a head of achenes usually with feathery styles.

^{*} Serial number in BENTHAM & HOOKER'S ' Genera Plantarum.'

Analysis of the Species.

Flowers in axillary fascicles.		
Flowers white or cream-coloured.		
Seps. erect; pedicels with 2 connate		
bracts	1.	C. napaulensis,
Seps. spreading; pedicels without bracts.	2.	C. montana.
Flowers dull-purple		
Flowers in axillary panicles.		
Sepals spreading.		
	4.	C. Gouriana.
Pubescent. Panicles few-flowered	5.	C. puberula.
Sepals erect.		•
	6.	C. connata.
Petioles not so connate.		
Leaves decompoundly pinnate	7.	C. nutans.
Leaves simply pinnate		C. Buchananiana
Leaves simply pinnate	8.	U. Buchananiano

1. C. napaulensis, DC.; Fl. Br. Ind. i. 2.

A slender climber. Leaves ternately divided; common petiole 1-1.5 in.; terminal leaflet or lobe 2-3 by 3.5 in., lateral half as long or shorter, sessile or very shortly petioluled. Flowers many; pedicels 1-2 in. long, with two hyaline bracts joined into a cup, pubes cent above the cup. Sepals 4, erect, cream-coloured. Filaments glabrous, base broad. Acknes flat, hairy; style 1.5 in. long in fruit.

Valleys in Higher Hills above 6,000 ft., scarce.—Matkángrá, Deotá, Mussoorie, etc.

Fl. Cold season. Fr. May.

2. C. montana, Ham.; Fl. Br. Ind. i. 2; Brandis Ind. Trees 1; Gamble Man. Ind. Timb. 2. Vern. Kauniá-báli, Jaunsar.

Stem thick, often 3 in. in diameter; young parts pubescent. Leares 3-foliolate, fascicled at the nodes, glabrescent; petiole 1.5-3 in. long. Leaflets 1-3 in. long, ovate, toothed; petiolule 1-3 in. Flowers 2-3 in. diam., white; peduncles 2-4 in. long, generally exceeding the leaves. Sepals 4, sometimes connate, 1-2 in. long, elliptical, spreading, pure-white. Filaments linear, short. Carpels hairy; style 6-1 in. long, rather stout, densely hairy.

JAUNSAR and Tehri-Garriwal, 6,-9,000 ft., fairly common. A very conspicuous plant during the month of May on account of its beautiful sprays of large white flowers, trailing over the tallest trees and very frequently over Deodar.

Fl. Apr., May.

3. C. barbellata, Edgew.; Fl. Br. Ind. i. 3; Gamble Man, Ind. Timb. 2. Vern. Kauni, Jaunser.

Stem rather thin. Leaves 3-foliolate, much like those of the last species. Fowers dull-purple, in axillary fascicles; pedicels 1.5-3 in. long. Sepals 6-8 in. long, erect, pubescent on both surfaces, greyish-purple outside, villous at the margins. Filaments linear, often hairy, as long as the sepals or shorter; anthers bearded at the back (whence the specific name). Athenes glabrous or puberulent; style 1.5-1.8 in. long, brown-hairy.

JAUNSAR, TEHRI-GARHWAL and OUTER HIMALAYA, above 7,000 ft., in shady places.—Mundáli, Deoban; Deotá; Mussoorie, etc.

Fl. May, June.

4. C. Gouriana, Roxb.; Fl. Br. Ind. i. 4; Brandis Ind. Trees 2. Vern. Bel Kúm, Bel Kangu, Dún.

Stem thick, striate; branches purple. Leaves bipinnate or biternate. Leaflets, 2-3.5 in. long, ovate, oblong or lanceolate, acuminate, entire or distantly toothed, cordate or rounded at the base, rather coriaceous, wholly glabrous or rarely pubescent beneath. Flowers greenish-white, small, in dense axillary panicles. Sepals 2-3 in. long, oblong, revolute; margins tomentose. Fildments narrow. Achenes lanceolate; style 1.5-2 in. long in fruit, very slender.

Common in the Dun and up to 4,000 ft. in the Outer Himalaya. Also found in the Siwaliks.

Fl. Aug., Sept.

5. C. puberula, Hook. f. & T.; Fl. Br. Ind. i. 4.

Stem grooved, moderately thick, downy. Leaves pinnate. Leaflets 1-1.5 in. long, ovate-lanceolate, entire or toothed. Panicles shorter than the leaves, few-flowered; branches opposite, subtended by leaf-like green bracts. Sepals 5, 5 in. long, silky without. Achenes ovoid, silky; style about 1 in. long in fruit.

Valleys in the Himalaya, at 2,-4,000 ft.: Tiuni, Májog, Dhármigádh, etc.

Fl. Sept., Oct.

6. **C. connata**, DC.; Fl. Br. Ind. i. 6. Vern. *Káuni-báli*, Jaunsar.

Stem thick; young parts with scattered hairs. Leaves pinnate or 3-foliolate, glabrous; petiole connate into a large flat cup (whence the specific name). Leaflets 2-4 in. long, broad-ovate, serrate or

lobed; base cordate. Panicles many-flowered. Flowers white, large. Sepals oblong, hairy, not ribbed. Filaments tapering, hairy. Achenes ovate, pubescent; style 1.5-2 in, long in fruit.

Forests of UPPER HILLS above 5,000 ft., not very common: Bhújköti, Mundáli, Konáin, etc.

Fl. May, June. Fr. Sept., Oct.

7. **C. nutans**, Royle; Fl. Br. Ind. i. 5; Gamble Man. Ind. Timb. 2. Vern. Näk-chhikni, Kángúli, Málköt; Káuni, Jaunsar.

Stem slender, woody, furrowed, very pungent to the taste. Leaves decompoundly pinnate. Leaflets 1-3 in. long, ovate or lanceolate, usually 3-5-lobed, silky. Flowers cream-coloured, in muchbranched panicles; pedicels with a pair of green bracts which are often leaf-like and subtend flower-buds. Sepals '5-'7 in. long, oblong, closely nerved, silky outside. Filaments tapering, silky near the bas: Achenes large, silky-hairy; style 1-1'5 in. in fruit, very slender.

OUTER HIMALAYAN slopes, 3,-5,000 ft.: Málköt, above Rájpur. Bindál Nadi near Dehra Dún (*Mr. C. W. Hope*).

The leaves are very pungent to the taste and produce violent sneezing if smelt after bruising.

Fl. Nov., Dec.

8. **C. Buchananiana,** DC.; Fl. Br. Ind. i. 6; Brandis Ind. Trees 2; Gamble Man. Ind. Timb. 2. Vern. Káuni Bálı, Jaunsar.

Stem thick, woody; branches widely climbing, pubescent when young. Leaves simply pinnate. Leaflets 2-4 in. long, ovate or orbiculate, coarsely lobed or serrate, pubescent; base corda'e. Flowers large, cream-coloured, sweet-scented, in many-flowered panicles. Sepals thick, ribbed, softly silky-tomentose. Filaments and achenes densely hairy.

Villages in the Himalaya above 4,000 ft. Scarce in Jaunsar, but common in parts of Tehri-Garhwal, e.g., Mautárgádh.

Fl. Oct., Nov.

- C. acuminata, DC.; Fl. Br. Ind. i. 5; Brandis Ind. Trees 2; has been found at the Bear-garden near Chakrata. It is a slender climber with glabrous leaves and cream-coloured flowers. Roots thick, fleshy, tuberous.
- C. grafa, Wall.; Fl. Br. Ind. i. 3—probably also occurs. It is a woody climber with a furrowed stem. Panicles decompound.

The following plants of herbaceous Genera are commonly met with and deserve mention:—

- 1. Anemone vitifolia, Ham.; Fl. Br. Ind. i. 8.—A perennial herb with 5-lobed radical leaves. Flowers large, white, in many-flowered scapes. Seeds white, woolly. Chakrata and the hills beyond, also Mussoorie and Málkot.—G. P. n. 4.
- 2. A. obtusiloba, Don; Fl. Br. Ind. i. 8. Vern. Ageli, Jaunsar. A herb with a thick densely white-woolly root-stock. Radical leaves 3-lobed, deeply cordate, densely silky-pubescent. Flowers varying in colour from blue to white. Above 8,000 ft.: Mundáli, Deoban. etc.
- 3. A rivularis, Ham.; Fl. Br. Ind. i. 9. Stem branched. Radical leaves 3-lobed. Flowers in many-flowered compound cymes, bluish outside. Achenes dark-brown, lanceolate, hooked at the tip. In damp places and snow gullies in the Hills, above 5,000 ft.
- 4. Delphinium denudatum, Wall.; Fl. Br. Ind. i. 25. The Larkspur. Vern. Main, Jaunsar. Very conspicuous in the spring season on dry grassy slopes in the hills up to 8,500 ft. Stem branched. Radical leaves 5-9-partite, orbicular. Flowers pale-blue, with a subulate spur. Fruit of 3 follicles.—G. P. n. 25.
- 5. D. vestitum, Wall.; Fl. Br. Ind. i. 26. Common in the Tutuagádh near Mundáli and on the northern slopes of Rikhshin, generally in shady ravines, 6,-12,000 ft. Stem 15-3 ft. long, hispid. Radical leaves 6-12 in. in diam., 5-7-lobed; lobes rounded, cut or toothed. Flowers dense, bluish-white; spur inflated, conical, incurved. Fruit of 3 follicles.
- 6 Actea spicata, Linn.; Fl. Br. Ind. i. 29. An erect perennial herb with 3-nately compound leaves and small white flowers in crowded racemes. Sepals and petals similar. Fruit a herry. Shady ravines in Jaunsar and Tehri-Garhwal.—G. P. n. 27.
- 6. Pæonia emodi, Wall.; Fl. Br. Ind. i. 30. A tall almost shrubby plant, remarkable for its large showy white or pink flowers, found in the upper Tons Valley, as in ravines above Naintwar and at Datmir and elsewhere from 7,000 to 10,000 ft.—G. P. n. 30.

FAM. 2. DILLENIACEÆ; G. P. N. 2.

Trees or shrubs, rarely herbs. Leaves alternate, simple, generally without stipules. Flowers large, showy.

Sepals 5, imbricate, persistent. Petals 5, rarely 3 or 4, deciduous. Stamens numerous, hypogynous, in many series. Carpels solitary or numerous, free or cohering at the base on the axis. Styles distinct. Seeds solitary or many, albuminous, arillate or immersed in pulp.

1. Dillenia, Linn.; G. P. n. 10.

D. indica, Linn.; Fl. Br. Ind. i. 36; Brandis For. Flora
 Ind. Trees 3; Gamble Man. Ind. Timb. 4. Vern. Châlta, Hind.

An evergreen tree in its habitat but generally leafless for a short time in June at Dehra Dún; bark reddish-grey, red inside, peeling off in hard flakes. Leaves generally approximate at the ends of the branches, 8-12 in. long, oblanceolate or oblong-lanceolate, sharply serrate, acute or acuminate, glabrous above, usually pubescent beneath; lateral nerves very numerous, parallel, prominent; petiole sheathing at the base. Flowers terminal, solitary, 6-8 in. across. Sepals orbicular, thick and fleshy, with membranous margins, spreading in flower, accrescent and enclosing the ovary in fruit. Petals 3-4 in. long, obovate, white, very tender. Inner stamens recurved. Styles bent outwards in radiating white rays 7 in. long. Fruit a pseudocarp, 3-5 in. diam., fleshy, enclosed in the much thickened concave sepals. Carpels 16-20; seeds reniform, sunk in a glutinous pulp.

Commonly cultivated at DEHRA and SAHÁRANPUR.

Wood reddish-brown, mottled with white specks, weighing about 45 lbs. per c. ft., fairly durable; medullary rays broad and shining. The fieshy calyx has an agreeable acid taste, and is eaten raw or cooked.

Fl. June, July. Fr. ripens in the cold season.

FAM. 3. MAGNOLIACEÆ; G. P. N. 4.

Trees or shrubs, sometimes climbing; wood-tissue with glandular markings. Leaves alternate, simple, entire or toothed, usually stipulate; stipules convolute, deciduous. Flowers axillary or terminal, trimerous, often large. Sepals and petals usually similar, hypogy-

nous, deciduous. Stamens indefinite, free or monadelphous; filaments usually flattened. Carpels indefinite, often arranged on an elongated torus; style usually short. Fruit of berry-like or follicular carpels, or like a woody cone. Albumen fleshy, uniform,

Analysis of the Genera.

Trees. Stipules conspicuous; stamens free . 1. MICHELIA. Climbing shrubs. Stipules none: stamens 2. SCHIZANDRA. monadelphous .

1. Michelia, Linn.: G. P. n. 6.

1. M. Champaca, Linn.; Fl. Br. Ind. i. 42; Brandis For. Flora 3, Ind. Trees 8; Gamble Man. Ind. Timb. 12. Vern. Champá. Hind.

A tall, graceful, evergreen tree with dark-grey bark. Leaves 6-8 by 2-3.5 in., ovate or oblong-lanceolate, coriaceous, entire, glabrous, dark-green and shining above, enveloped in convolute stipules in bud: main lateral nerves 8-14 pairs; base acute; petiole 1-12 in. long. Flowers solitary, axillary, bracteate, pale-yellow, very fragrant : meduncle short, stout ; bracts small, deciduous. Sepals and petals 15-21, in several series, those of the inner series gradually narrower. Fruit 3-4 in. long; carpels 5-7 in. long, subsessile, darkcoloured, with white specks,

Cultivated in the Dún, and also in the Samiranpur District.

Heartwood light olive-brown, very durable, seasons and polishes well; weight about 38 lbs. per c.ft. It is used for furniture. The flowers are used by Hindus in religious ceremonies and are indispensable on certain occasions.

Fl. chiefly Apr.-June, but occasionally throughout the year.

2. Schizandra, Michaux; G. P. n. 8.

Sinistrorsely climbing glabrous shrubs. Leaves exstipulate. Flowers axillary, 1-sexual and directious, white, yellow or orange. Sepals and petals 9-12, generally in 3 series. Stamens 5-15 or more, spirally arranged; filaments usually monadelphous and short or wholly connate into a fleshy head; anthers free, or sessile and half-buried in the head of connate filaments; cells small, remote. Carpels many, densely imbricated; stigma sessile; ovules 2, pendulous. Fruit an elongated spike of 1-seeded globose carpels. Seeds with copious albumen.

Analysis of the Species.

Filaments free above; anthers free . . . 1. S. grandiflora.
Filaments connate into a fleshy head; anthers
imbedded in the head 2. S. propnqua.

1. **S. grandiflora**, Hook f. & T.; Fl. Br. Ind. i. 44; Brandis For. Flora 571, Ind. Trees 9; Gamble Man. Ind. Timb. 14. Vern. Bállon, Bános, Jaunsar.

A climber with dark-brown smooth bark and short leaf-bearing branches at the nodes. Leaves 3-6 in. long, elliptic to oblong-lanceolate, acuminate, distantly glandular-toothed, rather soft and fleshy, shining above, pale beneath; lateral nerves 6-8 pairs, faint; base acute; petiole 5-1 in. long. Flowers diæcious, axillary, white, fragrant, about 1 in. diam.; pedicels 1-2 in. long, of male flowers somewhat shorter. Sepals and petals 9-12, imbricate. Stamens in a spiral series, monadelphous below, free and tubular above. Ovaries imbricated on a conical receptacle which lengthens in fruit into a fleshy axis 6-9 in. long, bearing numerous scarlet carpels.

JAUNSAB and TEHRI-GARRWAL, 6,-10,000 ft., affecting shady places: Deoban, Mundáli; Bámsu, Deotá, etc. Common but not abundant.

- Fl. May, June. Fr. July, Aug.
- 2. S. propinqua, Hook f. & T.; Fl. Br. Ind. i. 45; Brandis Ind. Trees 9; Gamble Man. Ind. Timb. 14.

A stout climber with dark-brown stem and rough verrueose branches. Leaves 4-6 by 1·5-2' in., ovate-lancolate, acuminate, obscurely gland-toothed, subcoriaceous, dark-green; lateral nerves 10·12 pairs, not prominent; base rounded; peticle 4-6 in. long rather stout. Flowers 5-7 in. diam., yellowish; pedicels 4-7 in.

long, bracteolate. Sevals and vetals imbricate, concave in bud. Stamens connate into a globose head about '3 in. diam.; anthers sessile, half-exserted. Ovaries and fruit as in the preceding species.

Very scarce. Korwá forests, Jaunsan; also below Mus-SOORIE. About 5,-6,000 ft.

Fl. June. July.

FAM. 4. ANONACEÆ; G. P. N. 5.

Trees or shrubs, often aromatic. Leaves alternate. simple, entire, exstipulate. Flowers usually 2-sexual. Sepals 3, free or connate, generally valvate. Petals 6, hypogynous, in two series, the inner sometimes absent. Stamens indefinite, filaments short or none; anthers adnate, with a connective enlarged to form a dilated or truncate head. Ovaries usually numerous, apocarpous, (syncarpous in Anona); style short or stigma sessile. Fruit of dry or succulent usually indehiscent carpels. Seeds large; testa horny; albumen ruminate.

1. Miliusa, Leschen.: G. P. n. 34.

1. M. velutina, Hook. f. & T.; Fl. Br. Ind. i. 87; Brandis For. Flora 6, Ind. Trees 11; Gamble Man. Ind. Timb. 21. Vern. Dom Sál, Hind.; Guá Sál, Garhwal.

A middle-sized deciduous tree; young branches tomentose; bark dark-grey, rough; inner substance dirty brown. Leaves 6-10 by 3.5-6 in., ovate elliptic or oblong, acute or acuminate, entire, softly tomentose on both surfaces, aromatic; base cordate; petiole 1-2 in. Flowers pale-yellow, in 3-6-flowered lax leaf-opposed racemes: peduncles '5-1 in. long, pedicles 2-4 in., slender. Sepals and outer petals similar, 'l in. long, ovate, valvate in bud; inner petals longer. broad-ovate, dark-brown, densely tomentose outside. Stamens on a cylindrical torus; anthers distinct. Fruit of a number of black dry 1-2-seeded berry-like carpels, on short stipes.

Common in the Sal forests of DEHRA DUN and SAHARANPUR, generally in ravines, or in open scrubby jungles.

Heartwood not distinct. The seasoned wood is fairly hard, light, of pretty grain; weight 40-50 lbs. per. c. ft, It is used for agricultural implements, and in constructions of a temporary character.

Fl. Mar.-May. Fr. June, July.

To this Family belong-

- 1. Anona squamosa, Linn.; Fl. Br. Ind. i. 78; Braudis Ind. Trees 22. Vern. Sharifá, Sitáphal, Hind., the Custard-apple; and
- 2. A. reticulata, Linn.; Fl. Br. Ind. i. 78; Brandis Ind. Trees 22. Vern, Noná, Rámphal, Hind, the Bullock's heart.

Both occasionally, but not commonly, cultivated in the Dún, more frequently in Sahábanpur.—G. P. n. 30.

FAM. 5. MENISPERMACEÆ; G. P. N. 6.

Climbing or twining, rarely erect shrubs. Leaves alternate, simple, entire or lobed, usually palminerved, exstipulate. Flowers small, usually idiccious. Sepals and petals similar, generally 6 each, in series of 3, the outermost whorl of sepals very minute. Male fils.: Stamens usually 6, opposite to the petals. hypogynous; filaments or anthers free or connate. Fem. fils.: Carpels 3, rarely 1, 6, or more; styles ultimately lateral or sub-basal; ovules solitary. Fruit a 1-seeded drupe. Seed curved into a crescent shape (whence the name of the Order), enclosed in a woody endocarp, usually with copious albumen.

1. Cocculus, DC,; G. P. n. 16.

Climbing or erect shrubs. Flowers panicled. Sepals 6, in two series. Petals 6, concave, embracing the

stamens in the male flowers. Styles usually cylindrical. Drupes circular, laterally compressed; endocarp horse-shoe-shaped, tubercled.

Analysis of the Species.

A large erect shrub. Leaves glabrous . 1. C. laurifolius. A climbing shrub. Leaves villous . 2. C. villosus.

1. **C. laurifolius**, DC.; Fl. Br. Ind. i. 101; Brandis For. Flora 9, Ind. Trees 26; Gamble Man. Ind. Timb. 25. Vern. *Til-phára*, Dún and Garhwal.

A large evergreen shrub with a short trunk and thin grey bark; branchlets with tufts of hairs at the base. Leaves 3.6 in. long; lanceolate, entire, dark-green and shining above, slightly pale beneath; base 3-nerved, acute; petiole 1-3 in. Panicles axillary, solitary or 2 together, corymbose. Flowers minute; petals 2-lobed. Styles reflexed. Drupe 15 in. diam., black when ripe.

Shady woods and moist places up to 4,000 ft. Banks of the Sông opposite Káluwála, Nakraunda, Bindál nálá, etc., in the Dún. Jumna Valley down to Dákhpathár. Moist ravines in the Lower Hills.

The wood is of a curious structure, having belts of corky tissue alternating with woody bands and looking like annual rings, which they obviously are not, as they frequently anastomose. It is used only for fuel.

Fl. Apr.-June.

2. C. villosus, DC.; Fl. Br. Ind. i. 101; Brandis For. Flora 9.

A climbing undershrub with tementose branchlets. Leaves very variable in size, the largest 3 by 2 in., ovate or ovate-oblong, mucronate, clothed with grey tomentum; petiole up to 5 in. Male fls. in axillary panicles; jem. fls. 1-3 together on short axillary pediods. Drupe 2 in. diam., dark-purple.

Foot of the Himalaya and Siwalik Forests, not very common.

"The juice of the ripe berries makes a durable bluish purple ink."—Sir D. Brandis. The roots and leaves are used medicinally.

Fl. Feb., March.

Analysis of the Species.

Leaves imparipinnate						1. B. nepalensis.
Leaves simple.						_
Flowers um bellate.						3. B. umbellata.
Flowers racemed.	,					
Leaves membranou	s. clo	selv s	errate	: sti	m a	
sessile.	.,			,,		2. B. vulgaris.
Leaves coriaceous	re	ticula:	te. e	ntire	or	
remotely tooth			, .		•-	
Leaves obovate		oadly	obla	nceol	ate ·	
stigma subset		oudig	0.014		,	
Branches and		وأمما	rad .	rana	m 88	
branched	pou	10019	rou,	Taco	ЩОБ	4. B. aristata.
		ماده داد			•	4. D. aristatu.
Branches grey	; pe	dicers	par	e-rea	or	F D
green ; race					• •	5. B. coriaria.
Leaves narrow-ol		olate	; ster	n wh	ite;	
style distinct					•	6. B. Lycium.
Leaves broad-oto	vate,	stron	gly re	ticul	ite;	
stem pale; st	yle di	istinct				7. B. asiatica.

1. **B. nepalensis**, Spreng.; Fl. Br. Ind. i. 109; Brandis For. Flora 12, Ind. Trees 28; Gamble Man. Ind. Timb. 28. Vern. Khōru, Jaunsar.

A small tree or large shrub with soft corky bark. Leaves coriaceous, shining, imparipinnate, with two recurved subulate spinescent stipules. Leaflets 2-12 pairs, 2-3.5 in. long, ovate or lanceolate, sessile, with 3-8 large spinous teeth on either side, shining above. Bracts 1-2 in. long, persistent, clothing the ends of the branches; bracteoles broad-ovate or oblong, deciduous. Racenes dense-flowered, 4-10 in. long, erect, in the axils of the bracts. Flowers yellow; pedicels '3-'5 in. long. Berries '3-'5 in. long, elliptic or globose, purple, glaucous.

JAUNSAR, 6,-8,000 ft. Common near Chakrata. Distrib. EUROPE.

The fruit is eaten.

Fl. Apr., May. Fr. May, June.

Note.—Like the English name Barterry, the Jaunsari names Káshmoi and Káshmal and the Garhwali name Kingora are applied indiscriminately to the following species, while their roots are sold by the deelers of country-drugs under the common name of Rasau: t or Dáruhata (Sans. Dáruhariðrá:

2. B. vulgaris, Linn.; Fl. Br. Ind. i. 109; Brandis For. Flora 11. Ind. Trees 28: Gamble Man. Ind. Timb. 29. Vern. Chatrod. Jaunsar.

A small shrub with soft brown bark. Leaves deciduous, 1-3 in, long, broadly obovate or spathulate, membranous, finely serrate, narrowed into a slender petiole which is 1-1 in. long: spines 3-7forked, rarely simple. Flowers pale-yellow, in simple racemes which are generally longer than the leaves. Berries oblong-ovoid, red, when ripe.

JAUNSAR and TEHRI-GARHWAL, 8,-12,000 ft.: Deoban: Rikhshin. Not very common.

The fruit is eaten.

Fl. Mar., Apr.

There are several varieties of this species, some of which seem almost specifically distinct, as they differ considerably in appearance and foliage from the type. One of these, which is found at Lokandi, Gidhi Khad and Rikhshin, is considered by Mr. Gamble to be var. ætnensis, sp. Presl.

3. B. umbellata, Wall.; Fl. Br. Ind. i. 110; Brandis Ind. Trees 30 : Gamble Man. Ind. Timb. 28.

A small shrub, generally occurring in gregarious patches; branches slender. Leaves 1-2 in. long, obovate, rather membranous, sparingly serrulate. Flowers yellow, somewhat unevenly umbellate on a long peduncle; pedicels slender. Berries oblong.

JAUNSAR and TEHRI-GARHWAL, 9,-11,000 ft.: Gidhi Khad; Rikhshin, etc.

Fl. Apr., May.

4. B. aristata, Roxb.; Fl. Br. Ind. i. 110; Brandis For. Flora 12, Ind. Trees 29; Gamble Man. Ind. Timb. 29. Vern. Káshmoi, Jaunsar: Kingorá, Garhwal.

An evergreen shrub 10-12 ft. high; branches usually bright red. Leaves 2-3 in. long, obovate or oblanceolate, rather coriaceous, entire or with a few remote teeth, in the axil of a 3-fid or simple Flowers bright-yellow, in cymosely branched racen es; peduncle 1-1.5 in. long, red; branches few-flowered; pedicels 2-3 in. long, also red. Berries tapering into a very short style, red.

JAUNSAR and TEHRI-GARHWAL, 6,-9,000 ft. Common.

An extract from the stem and roots is used in medicine.

Fl. Apr., May. Fr. June, July.

5. **B. coriaria**, Royle; Gamble Man. Ind. Timb. 29; Brandis Ind. Trees 30. Syn.—B. aristata var. floribunda, Wall.; Fl. Br. Ind. i. 110. Vern. Káshmoi, Jaunsar; Kingorá, Garhwal.

A large thorny shrub with grey bark; branches grey, rarely reddish, rather stouter than those of B. aristata. Leaves 3-4 in. long, obovate, entire or distantly sharp-toothed, green beneath; veins very fine or indistinct. Flowers usually in simple racemes which are 2-3 in. long; peduncle slightly angled; pedicels '2-'3 in. long; bracts persistent. Berries ovoid, purple, covered with a glaucous bloom.

HIGHER HILLS, 7,-9,000 ft. Common at Bodyár, Konáin, Deoban and Lambátách.

Economic use as of B. aristata.

Fl. May, June. Fr. July, Aug.

6. **B. Lycium**, Royle; Fl. Br. Ind. i. 110; Brandis For. Flora 12, Ind. Trees 29; Gamble Man. Ind. Timb. 30. Vern. *Chatroi*, Káshmal, Jaunsar.

A shrub usually much smaller than the last two species, and somewhat gregarious in habit; bark white. Leaves 1.5.2.5 in. long, oblanceolate, subsessile, muoronate, coriaceous, glaucous beneath, with prominent reticulate veins. Racemes simple or comjound, generally exceeding the leaves; pedunce glaucous. Flowers dullyellow. Berries ovoid, violet, with a distinct style at the apex.

JAUNSAR, TEHRI-GARHWAL, and OUTER HIMALAYA, 3,-7,000 ft. Quite abundant in certain localities. : Korwá, Chakrata, Málköt, below Mussoorie, etc.

Economic use as of the last two species. .

Fl. Apr. Fr. May.

7. **B. asiatica,** Roxb.; Fl. Br. Ind. i. 110; Brandis For. Flora 12, Ind. Trees 29; Gamble Man. Ind. Timb. 30. Vern. *Kingorá*, Dún and Garhwal.

A much-branched spreading shrub with pale bark. Leaves 2-3 in. long, broad-obovate, hard, coriaceous, strongly reticulate and grey beneath, usually with large distant spinous teeth. Racemes corymbose, dense-flowered, shorter than the leaves. Flowers '2 in. diam., pale-yellow. Berries '4-'5 in. long, ovoid, red or black, plaucous.

LOWER HILLS generally between 3,000 and 5,000 ft., but along the OUTER HIMALAYAN STREAMS as low down as Thano, 2,400

ft., the Bindál nadi near Dehra, 2,200 ft., and in the Suswa near Phándowála, 1,800 ft.

Berry edible.

Fl. Feb.-Apr. Fr. Apr.-June.

To this Family belongs the herbaceous plant Podophyllum emodi, Wall.; Fl. Br. Ind. i. 112. Vern. Rikhretá, Jaunsar;—the rootstock of which yields the valuable medicine known as Podophylline. Leaves 2 or 3, 6-9 in. diam., 3- or more-lobed, margins laciniate and serrate. Flowers 1-1-5 in. diam., white or light-rose. Fruit ovoid, 1.5-2.5 in. long. Common in shady places above 7,000 ft. in Jaunsar and Tehri-Garhwal.—G. P. n. 18.

Order 2.—PARIETALES.

FAM. 7. CAPPARIDACEÆ; G. P. N. 12.

Herbs or shrubs, rarely trees. Leaves alternate, simple or palmately 3-9-foliolate. Flowers usually bisexual, cruciform, regular or irregular. Sepals 4, free or connate. Petals generally 4, hypogynous or seated on a disk. Stamens 4-8, or indefinite, inserted at the base of a gynophore; filaments slender; anthers versatile. Ovary usually long-stipitate, 1-celled; style short or 0; ovules indefinite, on parietal placentas. Fruit a berry or a capsule. Seeds exalbuminous.

Analysis of the Genera.

Generally climbing or straggling shrubs.

Leaves simple: petals sessile . . 1. Capparis.

A tree. Leaves trifoliolate; petals clawed . 2. Cratæva.

1. Capparis, Linn.; G. P. n. 17.

Shrubs, rarely trees, usually with stipulary thorns. Leaves simple, sometimes caducous. Sepals 4, usually

free. Petals 4, sessile, imbricate. Stamens indefinite; filaments filiform. Ovary on a long gynophore; stigma sessile. Fruit a fleshy berry; seeds many.

Analysis of the Species.

Flowers large, solitary, axillary 1. C. spinosa.
Flowers small, umbelled 2. C. sepiaria.
Flowers large, 2-4 in vertical lines,
supra-axillary 3. C. horrida.

1. **C. spinosa**, Linn.; Fl. Br. Ind. i. 173; Brandis For. Flora 14, Ind. Trees 33; Gamble Man. Ind. Timb. 33. The Caper plant. Vern. *Kiári*, *Báuri*, Jaunsar.

A small trailing shrub; young parts covered with a white or yellowish caducous tomentum; thorns straight or recurved, rarely absent. Leaves 1-2 in. long, orbicular or broad-ovate, entire, thick, muoronate, nearly glabrous. Flowers 1-3 in. diam., white, fading into purplish red. Sepals unequal, concave. Petals 1 in. long, clawed, obovate, undulate. Stamens numerous, purple, longer than the petals. Gynophore as long as the stamens, with glands at the base. Fruit 1-3 in. long, red inside when ripe.

On dry hot rocks at low elevations in the Hills. : Tons and Pábar valleys.

"The fruit is pickled, and the leaves and ripe fruit are a favourite food of goats and sheep."—Sir D. Brandis.

Fl. May-July. Fr. Cold season.

2. C. sepiaria, Linn.; Fl. Br. Ind. i 177; Brandis For. Flora 15, Ind. Trees 34. Gamble Man. Ind. Timb. 35.

A large climbing shrub with thorny stem and branches. Leaves green, very variable, usually 1-2 in long and ovate. Flowers white, '3-'5 in diam., in sessile or shortly peduncled unbels; pedicels slender, '5-'8 in long. Sepals ovate. Petals narrow-oblong. Ovary ovoid. Fruit '3 in diam., black, on a short gynophore.

Scrub forests at the foot of the Saháranpur Siwaliks, e.g., Barkálá, Kasúmri, Kôtri, Ránipur, etc.

Fl. Rainy season.

3. C. horrida, Linn.; Fl. Br. Ind. i. 178; Brandis For. Flora 15, Ind. Trees 35; Gamble Man. Ind. Timb. 36. Vern. His. Hins, Kalis, Kálhis, Kálhis, Khalis, Dún; Jhiri, Hind.

A tall scrambling shrub, covered when young with ferruginous caducous tomentum; stem thickly beset with scattered thorns. Leaves 4 by 2-5 in. but often much smaller, oblong or ovate, mucronate. Flowers 1.5-2 in. diam., white, fading into dull-rose; pedicels 5-1 in. long, 2-4 in a vertical line above the leaf. Stamens very numerous, purple. Fruit subglobose, 1-1.5 in. diam., on a gynophore 1.5-2 in. long.

Common in scrub forests in the Dún, and at the base of the Saháranpur Siwaliks: Kálsi; Ránipur, etc.

The leaves and twigs are eaten by goats, cattle and elephants. Fl. Feb.-May. Fr. Aug., Sept.

2. Cratæva, Linn.; G. P. n. 21.

1. **C. religiosa,** Forst.; Fl. Br. Ind. i. 172; Brandis For. Flora 16; Gamble Man. Ind. Timb. 32. Vern. *Bárna*, Saháranpur.

A moderate-sized deciduous tree; bark grey, fairly smooth, with long horizontal wrinkles. Leaves 3-foliolate; petiole 4-6 in. long. Leaflets 3-6 by 1'3-3 in., ovate or ovate-lanceolate, acuminate, entire, glabrous, subcoriaceous, pale beneath; petiolules auriculate. Flowers 2-3 in. diam., white, pale-yellow or light-rose, in many-flowered lax terminal corymbs. Sepals 4, deciduous. Petals 4, long-clawed, oblong, ovate or spathulate, 1-1'5 in. long. Stamens numerous; filaments slender, free, exceeding the petals. Ovary on a long gynophore. Stigma sessilé. Fruit a many-seeded ovoid berry, 1-2 in. diam., rough with white specks; seeds imbedded in a yellow pulp.

Foot of the Saháranpur Siwaliks near Bádsháhibágh, Mohand, Beribára, Gaj-Ráu Block, etc. Also Pathri Forest. Rather scarce. Cultivated in gardens for the flowers.

Wood yellowish-white, moderately hard, even-grained; weight about 45 lbs. per c. ft. It is used for drums, models, writing boards, combs, and turnery. The leaves are lopped for cattle- and camel-fodder.

Fl. Apr., May.

FAM. 8. BIXACEÆ; G. P. N. 17.

Trees or shrubs. Leaves alternate, simple; stipules minute or 0. Flowers regular, 1-2-sexual. Sepals 4-5.

imbricate, often deciduous. Petals 4-5 or 0, caducous. Stamens often numerous and hypogynous, opening by pores or slits. Ovary generally 1-celled; ovules parietal, usually numerous. Fruit either a dry capsule dehiscing by valves, or a fleshy indehiscent berry. Seeds arillate or with a pulpy testa; albumen copious.

Analysis of the Genera.

Leaves lobed; petal						1.	Cochlospermum.
Leaves not lobed; dehiscent.	petal	s nor	ie; fi	uit ir	1-		
C+ 1 0						2.	FLACOURTIA.
Style I						3.	XYLOSMA.

1. Cochlospermum, Kunth.; G. P. n. 1.

1. C. Gossypium, DC.; Fl. Br. Ind. i. 190; Brandis For. Flora 17, Ind. Trees 38; Gamble Man. Ind. Timb. 37. Vern. Gejrá, Arlú, Saháranpur.

A small deciduous tree with short branches and deeply cracked thick bark. Leaves palmately 5-lobed, 4-6 in. diam.; lobes acuminate, more or less tomentose beneath; petioles thick, 6-9 in. long. Flowers 2-sexual, 3-4 in. across, in terminal panieles, appearing before the leaves; peduncle and pedicles covered with grey tomentum. Sepals 5, ovate or elliptic, 5 in. long, silky. Petals 5, bright-yellow, obovate, 1-2 in. long, with numerous fine parallel veins. Stamens numerous, inserted on a disk; filaments 5-7 in. long, filiform; anthers opening by a slit at the top or by a pore. Fruit a pyriform capsule, 5-valved; valves 2-3 in. long. Seeds kidney-shaped, 2 in. long, covered with soft silky wool.

Common on dry slopes of the OUTER SIWALIES, especially towards Ránipur.

Wood very soft, light and spongy, of no use: A white gum exudes from the bark which is used in country medicine under the name Katirá. A very showy tree in the hot season.

Leafless Dec.-Apr. Fl. Mar., Apr. Fr. June, July.

2. Flacourtia, Commers.; G. P. n. 17.

Trees or shrubs, generally spinous. Leaves crenate. Flowers small, usually directions. Sepals 4-5, small, imbricate. Petals none. Stamens numerous: anthers versatile. Ovary on a glandular disk; styles 2 or more. Fruit a berry with many seeds.

Analysis of the Species.

Leaves long-acuminate, quite glabrous: 1. F. Cataphracta. Leaves rounded or obtuse, tomentose beneath: fruit small. 2. F. Ramontchi.

1. F. Cataphracta, Roxb.; Fl. Br. Ind. i. 193; Gamble Man. Ind. Timb. 39; Brandis Ind. Trees 39. Vern. Pachnálá, Jamuuá, Dún.

A small evergreen tree, bearing compound spines up to middle age; bark smooth. Leaves 3-5 in. long., ovate or ovate-lanceolate. long-acuminate, crenate, thin but tough, quite glabrous, shining above : base acute, rarely rounded ; petiole 1-2 in. long. Flowers very small, in irregular racemes; stigmas 4-6. Fruit globose, 5-7 in. diam., crowned by the persistent stigmas, on peduncles '3-'5 in. long, very acid, dark-purple when ripe.

Sál forests of the Dún. Common along the banks of the Ré nadi, and in other low-lying shady places. Occasionally in the Sahá-BANPUR DISTRICT, e.g., at Dholkhand.

The wood is hard and compact and is used for agricultural implements. The acid fruit is eaten.

Fl. July, Aug. Fr. Nov., Dec.

√2. F. Ramontchi, L'Herit.; Fl. Br. Ind. i. 193; Brandis For. Flora 18, Ind. Trees 40; Gamble Man. Ind. Timb. 40. Vern. Kandái, Kandei, Hind.; Kángo, E. Dón.

A small thorny deciduous tree with rough whitish-grey bark; young parts tomentose. Leaves 2-4 in. long, ovate obovate or suborbicular, obtusely serrate or crenate, glabrous or glabrescent above. usually tomentose beneath; petiole '2-'3 in. long, tomentose. Flowers small, greenish-yellow, in short racemes. Sepals rusty-hairy.

Stigmas 5-11, free or connate. Fruit globose, '3-'5 in. diam. subacid, red or dark-brown when ripe; seeds 8-16.

Throughout the Forests of the SIWALIK DIVISION. Also MUSSOORIE and MALKOT HILLS; at Kálsi, Saiá and in the Tons valley in JAUNSAR,—up to about 4,000 ft.; most abundant in scrub forests.

The wood is hard and durable, and is used for agricultural implements. The leaves and twigs are lopped for fodder. The fruit is eaten.

Leafless Feb., Mar. Fl. Mar., Apr. Fr. May, June.

3. Xylosma, Forster; G. P. n. 19.

1. **X. longifolium,** Clos.; Fl. Br. Ind. i. 1904; Brandis For. Flora 19, Ind. Trees 40; Gamble Man. Ind. Timb. 18. Vern. Stálu, Kátári, Kandhára, Dún; Phaláma, Garhwal.

A moderate-sized evergreen tree thorny when young, proragated chiefly by rootsuckers. Leaves 3-6 by 1-2 in., oblonglanceolate, obtusely serrate, coriaceous, glabrous, shining above when young, deeper green but dull when old; petiole '2-'4 in. long. Flowers small, yellow, diœcious, in short dense-flowered axillary panicles; pedicels bracteate. Petals none. Style 1, short. Fruit a 2-8-seeded more or less dry berry, about '2 in. diam.

Common in shady ravines throughout the Din, occasionally also in the Saháranpur-Siwaliks. Also in valleys in the Mussoo-Rie and Málköt Hills and in Jaunsar. Lachiwála, Mohkumpur, Karwápáni, Ámbári, Chilláwáli Ráu, etc.

The wood is pinkish, moderately hard and even-grained, used chiefly for fuel and charcoal; weight 55 lbs. per c. ft.

Fl. Nov.-Jan. Fr. Mar.-May.

Order 3.—POLYGALES.

FAM. 9. PITTOSPORACEÆ; G. P. N. 18.

Trees or shrubs, sometimes climbling. Leaves alternate, rarely subverticillate, usually entire, exstipulate. Flowers usually 2-sexual. Sepals and petals 5 each,

imbricate. Stamens 5, hypogynous, alternating with the petals; anthers versatile. Ovary 1-celled with 2-5 parietal placentas; ovules many; style simple; stigma 2-5-lobed. Fruit capsular or indehiscent. Seeds usually many.

1. Pittosporum, Banks; G. P. n. 1.

Trees or shrubs. Sepals and petals free or connate at the base. Stamens erect; filaments subulate. Ovary usually 2-valved. Fruit a 1-celled 2-valved capsule. Seeds smooth, imbedded in a viscid pulp.

Analysis of the Species.

(Sir D. Brandis.)

1. **P. floribundum**, W. & A.; Fl. Br. Ind. i. 199; Brandis For. Flora 19, Ind. Trees 42; Gamble Man. Ind. Timb. 43.

A small handsome tree with a short trunk and spreading branches; bark ash-colour or yellowish-grey, rough with small white specks. Leaves 3-6 in. long, lanceolate or elliptic-oblong, acute or acuminate, thinly coriaceous, shining above; margins wavy or obscurely toothed; midrib prominent; lateral nerves faint; petiole '5.'7 in. long. Flowers yellowish, numerous, about '3 in. across, in corymbosely branched short terminal panicles. Sepals subciliate. Petals free, linear-oblong. Style persistent. Capsule the size of a pea, rugose, yellow when ripe; seeds about 6, in a red pulp.

OUTER HIMALAYA and the D´en, in shady places or ravines.— Rámgarh, Mohkumpur, Lachiwála, Mothronwála, Karwápáni, Timli Pass, etc.

Wood light-grey, strong and tough, but used only for fuel. Fl. Jan.-June. Fr. Apr.-Nov.

2. P. eriocarpum, Royle; Fl. Br. Ind. i. 199; Brandis For. Flora 19. Ind. Trees 43; Gamble Man. Ind. Timb. 44.

A small tree with spreading branches; young parts brown-tomentose. Leaves 4-8 in. long, obovate or broadly oblanceolate, glabrate above, yellowish-tomentose beneath; petiole 7-1-2 in. long. Flowers pale-yellow, 3 in. across, in many-flowered umbellate corymbs. Sepals lanceolate, tomentose. Petals free, linear. Capsules 5 in. diam., felted-tomentose, tipped with the persistent style; valves woody; seeds many.

MUSSOORIE HILLS; above Rájpur in Kiárkuli Forest, also at Sahansra-dhárá, 3, 6,000 ft.: Ámláwa Valley in Jaunsar.

Wood used only for fuel.

Fl. Mar., Apr. Fr. May-July.

Order 4.—CARYOPHYLLALES.

FAM. 10. TAMARICACEÆ; G. P. N. 24.

Shrubs or small trees. Leaves alternate, minute, often scale-like and adpressed on the branches, exstipulate. Flowers regular, usually 2-sexual, in simple or panicled spikes or racemes. Sepals and petals often 5 each, imbricate, free or connate below. Stamens as many or twice as many as the petals, inserted on a glandular disk; anthers versatile. Ovary with 3-5 carpels, Fruit a capsule dehiscing into 3-5 valves. Seeds hairy or winged.

1. Tamarix, Linn.; G. P. n. 1.

1. **T. dioica**, Roxb.; Fl. Br. Ind. i. 249; Brandis For. Flora 21, Ind. Trees 46; Gamble Man. Ind. Timb. 46. Vern. Jháu Lál Jháu, Hind.

A gregarious shrub; bark reticulately cracked. Leaves minute, sheathing, acuminate, green with white margins. Flowers

usually dioccious, light rose-coloured. Sepals and petals free,; bracts acuminate, with a sheathing base, as long as the flowers. Stamens 5, about twice as long as the petals: Capsules oblong, 2 in. long.

Along open streams in the Dún, such as the Sông and Suswá rivers; also in the ráus of the Saháranpur Siwaliks, and at Bishenpur and other places along the Ganges.

Wood red and moderately hard, but used chiefly for fuel. Weight about 50 lbs. per c. ft.

Fl. May-July. Fr. Cold season.

Order 5.—GUTTIFERALES.

FAM. 11. HYPERICACEÆ; G. P. N. 26.

Herbs or shrubs. Leaves opposite, entire, gland-dotted, exstipulate. Flowers regular, 2-sexual, usually cymose, terminal or axillary, generally yellow. Sepals usually 5, imbricate. Petals as many as the sepals, contorted in bud. Stamens indefinite, 3-5-adelphous, rarely free or monadelphous; anthers versatile. Ovary 1-3-5-celled; ovules numerous, generally on axile placentas; styles 3-5, filiform, united. Fruit a septicidal capsule. Seeds numerous, exalbuminous.

1. Hypericum, Linn.; G. P. n. 2.

Herbs or shrubs. Leaves generally sessile. Flowers cymose. Petals yellow, usually oblique, sometimes gland-dotted.

Analysis of the Species.

Flowers large; styles twice the length of the ovary 1. H. cernuum.

Flowers small; styles as long as the ovary . 2. H. patulum.

. l. **H. cernuum**, Roxb.; Fl. Br. Ind. i. 253; Brandis Ind. Trees 48; Gamble Man. Ind. Timb. 48. Vern. *Pingniárá*, *Phiunli*. Jaunssr: *Piuli*. Málköt.

A glabrous shrub. Leaves 1-3 by '5-1 in., decussate, sessile, elliptic or ovate-lanceolate, entire, minutely dotted, glaucous beneath; tip acute or rounded. Flowers 2 in. diam., bright goldenyellow, 3-5 in a short terminal cyme. Petals obovate, longer than the stamens. Styles '5-'8 in. long, spreading. Capsules conical, '3-'5 in. long.

Throughout JAUNSAR and the OUTER HIMALAYA, 5,-8,000 ft., often on rocks.—Korwá. Kathián. Málköt, etc.

Fl. Apr., May.

2. H. patulum, Thunb.; Fl. Br. Ind. i. 254; Brandis Ind. Trees 48; Gamble Man. Ind. Timb. 48.

A shrub. Leaves distichous, 5-1-5 in. long, narrow-rhomboid or elliptical, very shortly petioled, black-dotted and rusty beneath; margins reflexed. Flowers 1 in. diam. Sepals 2 in. Petals yellow, orbicular or elliptical, longer than the stamens. Styles equalling the ovary but exceeding the stamens. Capsules obtusely conical, 2-3 in. long.

HILLS of MUSSOORIE and JAUNSAE at 5,-7,000 ft. in shady ravines, sometimes on rocks.

Fl. Apr., May.

FAM. 12. TERNSTRŒMIACEÆ; G. P. N. 28.

Shrubs or trees. Leaves alternate, simple, exstipulate, usually coriaceous. Flowers regular, generally showy and 2-sexual, usually subtended by a pair of bracts. Sepals and petals 5 each, imbricate, the latter sometimes connate below. Stamens numerous, hypogynous, free or connate at the base, often adnate to the petals. Ovary syncarpous, usually 3-5-celled, rarely many-celled; ovules 2 or many in each cell, on axile placentas; styles as many as the cells, free or connate. Fruit a berry or a capsule. Seeds few or many; albumen scanty or 0.

Analysis of the Genera.

Erect shrubs or trees.	
Leaves smooth, evergreen; flowers white, on	
simple pedicels.	3 77
	1. EURYA.
	4. CAMELLIA.
Leaves rough, deciduous; flowers usually pink,	
panicled	3. SAUBAUJA.
Climbing shrubs. Flowers white, cymose; fruit	
a fleshy berry	2. ACTINIDIA.

1. Eurya, Thunb.; G. P. n. 12.

1. **E. acuminata**, DC.; Fl. Br. Ind. i. 285; Gamble Man. Ind. Timb. 64 Brandis Ind. Trees 58. Syn.—*E. japonica*, Thunb. (partly); Brandis For. Flora 24.

An evergreen shrub with brown smooth bark; branchlets terete; young parts generally hairy. Leaves 2-4 by '5-'8 in., oblong-langeolate, acuminate, closely crenate-serrulate, coriaceous, usually glabrous above; midrib depressed above, hairy beneath; lateral nerves indistinct; petiole very short. Flowers white, small, diecious, about 5 together in the axils of the leaves; pedicels short, 2-bracteolate. Sepals 5, concave, pubescent outside. Petals 5, white, alternating with and exceeding the sepals, '1 in. long, more or less united below. Stamens 12-15, shorter than the petals. Fruit globose, of the size of a peppercorn, crowned by the remains of the styles.

OUTER HIMALAYA, 3,-7,000 ft.: Málköt Hills; Mussoorie-Also low valleys in the HILLS, e.g., Bámsu, Kulni, etc.

Wood reddish-brown, close-grained, moderately hard.

Fl. Nov., Dec.

2. Actinidia, Lindl.; G. P. n. 14.

1. A. callosa, Lindl.; Fl. Br. Ind. i. 286; Brandis Ind. Trees 62.

A climbing shrub; stems brown, white-warted. Leaves 3-5 by 2-3 in., broadly elliptic, acuminate, serrulate; lateral nerves 6-8 pairs; petiole 1-2-5 in. Flowers white, '5 in. diam., polygamous or

dioccious in lax umbellate axillary cymes. Sepals 5, oblong, obtuse, tomentose. Petals 5, contorted imbricate. Stamens many. Ovary hairy, many-celled; styles numerous, elongated after flowering. Fruit a fleshy ovoid berry. 8 in. long, edible.

Valleys below MUSSOORIE and in DEHRA DUN (Mr. P. W. Mackinnon). Very scarce.

Fl. June. Fr. Sept.

3. Saurauja, Willd.; G. P. n. 15.

1. S. napaulensis, DC.; Fl. Br. Ind. i. 286; Brandis For. Flora 25, Ind. Trees 62; Gamble Man. Ind. Timb. 65. Vern.

Ratendú, Jaunsar; Goginá, Hind.

A small tree sparingly branched; bark reddish-brown; young parts and inflorescence covered with long tapering stiff brown hairs. Leaves approximate at the ends of the branches, 7-14 by 2·5-4 in, oblong or oblanceolate, acute or short-acuminate, acutely serrate, rusty-tomentose beneath, especially when young; lateral nerves numerous, parallel, prominent; petiole 1-1·5 in., rough. Flowers pink, 5 in. diam., in lax drooping axillary panicles; bracts imbricate. Sepals small, fleshy. Petals pink, usually connate at the base; margins fimbriate. Stamens many; anthers dehiseing by pores. Fruit fleshy, green, 5-lobed, with a mealy sweet pulp. Seeds reddish-brown, small.

Damp walleys in the Hills, 3,-5,000 ft.: Mayargádh below Jádi, Garugádh in the Tons Valley, Sansáru Khálá, etc.

Wood light-pink, soft, spongy. The ripe fruit is eaten.

Fl. Apr., May. Fr. May, June.

4. Camellia, Linn.; G. P. n. 24.

1. C. theifera, Griff.; Fl. Br. Ind. i. 292. Syn.—C. Thea, Link; Brandis For. Flora 25, Ind. Trees 61; Gamble Man. Ind. Timb. 68. The Tea plant. Vern. Chá or Cháh, Hind.

A large evergreen shrub. Leaves 3-6 by 1-2.5 in., ellipticoblong, acute or acuminate, serrate, usually coriaceous, glabrous above, slightly pubescent along the nerves beneath; petiole 15 in. Flowers 1-1.5 in. diam., axillary, solitary or a few together on short pedunoles; bracts 2-3, sepal-like. Sepals 5, leathery, concave, more or less pubescent, edges ciliate. Petals white, 5-7 in. long, broadly obovate, slightly coherent at the base. Stamens numerous, cohering

at the base, adherent to the base of the petals. Ovary 3-5-celled. Fruit a loculioidal capsule, 7-9 in. diam., leathery; seeds few, pale-brown.

Largely cultivated in plantations in the Dún. The wood is moderately hard and close- and even-grained. Straight branches of unpruned shrubs make very good walking sticks.

Fl. Dec.-Mar. Fr. Sept.-Dec.

FAM. 13. DIPTEROCARPACEÆ; G. P. N. 29.

Usually resinous trees. Leaves alternate, simple, entire, penninerved; stipules usually small and early deciduous. Flowers regular, 2-sexual, in panicles. Calyx gamosepalous, campanulate, free or adnate to the ovary, 5-lobed; 2 or more of the lobes usually accrescent in fruit forming wings. Petals 5, twisted. Stamens 5-15 or indefinite, hypo- or perigynous, free, connate or adnate to the petals; anthers with an aristate connective. Ovary slightly immersed in the torus, usually 3-celled. Fruit capsular or nut-like, usually winged with the variously enlarged calyx-lobes. Seed usually exalbuminous; cotyledons fleshy.

1. Shorea, Roxb.; G. P. n. 8.

1. **S. robusta**, Gærtn.; Fl. Br. Ind. i. 306; Brandis For. Flora 26, Ind. Trees 69; Gamble Man. Ind. Timb. 77. The Sál tree. **Vern**. Sál, Hind.

A large tree, deciduous but seldom quite leafless; bark of young trees blackish-brown, smooth or with a few longitudinal cracks, marked with minute grey specks; of old trees very thick, darkgrey, rough with irregular furrows. Leaves 4-12 by 2-7 in., ovate-oblong, acuminate, tough, thinly coriaceous, glabrous and shining when fully mature; lateral nerves 12-15 pairs, those near the apex very slender; base cordate or rounded; petiole terete, 5-8 in. long; stipules '3 in. long, pubescent, caducous. Flowers subsessile, in

large lax terminal or axillary racemose panicles, covered with white pubescence. Calyx-tube short, adnate to the torus; segments ovate, all accrescent in fruit. Petals pale-yellow, about '5 in. long, narrow-oblong or lanceolate, much exceeding the calyx-segments in flower. Stamens up to 50, many times shorter than the petals; connective subulate, bearded, minutely trifid at the apex. Ovary 3-celled; style subulate. Fruit '5 in. long, ovoid, acute, rather fleshy, indehiscent, white-pubescent; wings 5, 2-3 in. long, spathulate, narrowed at the base, brown when dry, somewhat unequal, with 10-12 straight parallel nerves.

The principal tree of the SIWALIK DIVISION ascending to 4.000 ft. in the OUTER HILLS OF MALKOT. MUSSOORIE and JAUNSAR, everywhere most remarkably gregarious. TERAL the sal tree attains 100-150 ft. with a clear stem to the first branch of 60-80 ft., and a girth of 20-25 ft."-Sir D. Brandis. Within the limits of this Flora, however, it is seldom more than 80 ft. in height and 6 tt. in girth, unless hollow inside. The sapwood is whitish, not durable. The heartwood is brown, cross-grained, hard, and very durable; weight when fully seasoned 50-60 lbs. per c. ft. It seasons very badly and warps and splits in drying. For building purposes, however, it is the strongest and most important timber of Northern India. The tree yields, when tapped, a large quantity of a white opaline resin which is burnt as an incense, being considered indispensable as such in certain Hindu religious ceremonies, and is also used to caulk boats and ships. An oil is extracted from the fruit, which is used for burning and to adulterate ghee. The fruit is also ground into flour and eaten by the poorer classes during times of scarcity.

New leaves and Fl. Mar., Apr. Fr. May-July.

Order 6. - MALVALES.

FAM. 14. MALVACEÆ; G. P. N. 31.

Herbs, shrubs or soft-wooded trees; bark with mucilaginous juice and tenacious fibre; young parts mostly covered with stellate hairs. Leaves alternate, stipulate, simple lobed or degitately compound, usually palminerved. Bracteoles 3 or more, often forming an epicalyx. Flowers regular, generally 2-sexual, axillary

or terminal, solitary fascicled or cymosely panicled. Sepals 5, more or less connate, valvate in bud. Petals 5, hypogynous, twistedly imbricate. Stamens generally indefinite, monadelphous, rarely pentadelphous; anthers 1-celled, bursting longitudinally. Ovary syncarpous; carpels generally numerous; ovules attached to the inner angle of each carpel. Styles more or less connate; stigma various. Fruit a loculicidal capsule, or of dry cocci. Seeds sometimes with silky tubular hairs well-known as cotton; albumen scanty or 0.

Analysis of the Genera.

Leaves simple; bracteoles 4-6; seed snaked . I. Kydia. Leaves digitate; bracteoles 0; seeds woolly . 2. Bombax.

1. Kydia, Roxb.; G. P. n. 19.

1. **K. calycina,** Roxb.; Fl. Br. Ind. i. 348; Brandis For. Flora 29. Ind. Trees 78; Gamble Man. Ind. Timb. 89. Verr. Púlá, Fúlú, Púli, Hind.

A moderate-sized deciduous tree; bark grey, exfoliating in long strips, rough with large white specks on branches; young parts covered with grey stellate hairs. Leaves 4-6 in. diam., rounded, cordate, palmately 5-7 nerved, generally with as many lobes or angles as nerves, glabrate or with scattered hairs above, downy and pale beneath; petiole about half the length of the blade. Flowers '5-'7 in. across, polygamous, generally diœcious, in much-branched axillary or terminal panicles. Bracteoles 4-6, accrescent and spreading in fruit. Calyx campanulate, 5-lobed, accrescent. Petals white, clawed, adnate to the staminal tube, longer than the calyx. Stamens monadelphous; the tube shorter than the petals and split half way into 5 segments, each bearing at the apex 3-5 sessile anthers. Carpels 3; style 3-cleft. Capsule subglobose, 3-velved; seeds reniform, furrowed.

Very common in the Dun and Sanáranuur Forests, also in valleys in the Hills at low elevations.

Wood white, soft, used only for fuel; weight 40-45 lbs. pure.ft. The tree is of little value except as a help to reproduct on in

blanks and glades. The bark is often used for tying up bundles of fagget in the forest. "In North India it is employed for the clarification of sugar."—Sir D. Brandis.

Leafless Feb.-Apr. Fl. July-Oct. Fr. Dec.-Feb.

2. Bombax, Linn.; G. P. n. 42.

1. B. malabaricum, DC.; Fl. Br. Ind. i. 349; Brandis For. Flora 30, Ind. Trees 77; Gamble Man. Ind. Timb. 90. The Silk-cotton tree. Vern. Simal, Semal, Hind.

A large deciduous tree. Stem straight, more or less buttressed at the base when old, covered with large conical prickles when young; branches whorled, horizontally spreading. Leaves digitate; common petiole 6-12 in. long. Leaflets 5-7, 6-9 by 3-5 in., lance-late oblanceolate or obovate, acuminate, entire, more or less coriaceous, glabrous; petiolule 1 in. long; stipules small, caducous. Flowers 4-5 in. across, fleshy. Calyx very fleshy, cup-shaped, bright silky-hairy inside. Petals crimson or orange, 3-6 in. long, oblong, white-tomentose outside. Stamens usually 5-adelphous; flaments numerous, the innermost forked. Ovary 5-celled; style 5-lobed at the apex. Capsule 5-7 in. long, oblong-ovoid, 5-angled. Seeds obovate, smooth, surrounded by long white silky hairs.

Common in the Dun and Saharanpur Districts ascending to 4,000 ft. in the Outer Himalaya and in valleys in the Hills, generally affecting water-logged places, e.g., the Pathri Forest, Saharanpur District, and Nakraunda, Jogiwala, and dry beds of the Sông in the Dun.

The wood is very soft and perishable, but durable under water; weight 17-32 lbs. per c. ft. It is used for planking, packing cases, toys, well-curbs and water-shoots. The calyx of flowers not yet fully open is eaten cooked as a vegetable. The cotton is used to stuff pillows and cushions. The seed is valued as a nourishing food for cattle which also greedily devour the flowers. The roots of saplings are used as a nervine tonic in Indian medical practice.

Fl. Jan.-Mar. Fr. Apr., May.

There are several shrubs or undershrubs belonging to this Family, either wild or cultivated in the SIWALIK Division, which deserve mention. Among these are-

- i. Cultivated plants .-
- 1. Gossypium herbaceum, Linn. 3 Fl. Br. Ind. i. 346, 347.
 2. ,, barbadense, Linn. The cotton plants,—which are easily recognized by the large leafy bracteoles and the white cotton surrounding the seeds. Vern. Kapás, Hind.—G. P. n. 39.
- 3. Hibiscus esculentus, Linn.; Fl. Br. Ind. i. 343. The Okra or Ladies' finger. Vern. Bhindi. The tender fruit is used as a vegetable.—G P. n. 34.
 - table.—G.P. n. 34.

 4. Hibiscus Rosa-sinensis, Linn. Vern.

 Jură, Hind.
 5. "mutabilis, Linn. Vern. Gulia-iajāib, Hind.
 6. "syriacus, Linn. Vern. Gurhal, Hind.
 ii. Wild plants.—

 1. Sida carpinifolia, Linn.
 Vern. Kharenti, Dún.
 3. "cordifolia, Linn.
 - 3. , cordifolia, Linn.
 4. Abutilon indicum,
 G. Don.
 5. , ramosum,
 Guill. & Perr.
 Guill. & Perr.
 Governormal Robert Flowers yellow.
 Governormal Governo

These are all weeds of roadside, forest-glades or waste places, but yield fibres which will probably be found of value in the future.

- 5. Urena lobata, Linn., Fl. Br. Ind. i. 329. Vern. Unga, Dún. Noticeable for its pink flowers and barbed capsules which attach themselves on to clothes. The stem gives a useful fibre. Leaves about 3 in. across, 5-7-lobed. Common in coppice areas and road-sides—G. P. n. 25.
- 6. Thespesia Lampas, Dalz. & Giba; Fl. Br. Ind. i. 345 Vern. Ban Karásı, Dún. A common undershrub in glades in Sál forests and also on fire-traces, easily recognized by its large bright-yellow flowers with a crimson centre which appear during the rains. Leaves 4-6 in. diam., 3-lobed, cordate; petiole 2-3 in. long. Capsule ovoid, 1 in. long, erect, generally infested with a bug of the Lygæidæ family. The plant yields a strong white fibre, and the flower is likely to give a useful dye.—G. P. n. 37.

FAM. 15. STERCULIACEÆ; G. P. N. 32.

Herbs, shrubs or trees, usually with soft wood; young parts generally tomentose; bark mucilaginous and with strong fibres. Leaves alternate, simple and lobed, or digitate, usually stipulate. Flowers generally regular, 1- or 2-sexual or polygamous, often bracteate, in axillary or terminal cymes or panicles, rarely solitary or fascicled. Calyx usually gamosepalous; segments 5. Petals 5 or none. Stamens usually monadelphous, with 5, 10, or 15 2-celled extrorse anthers. Ovary stipitate or sessile, free, 2-5-celled, apocarpous or syncarpous. Fruit a loculicidal capsule, or of distinct follicular carpels. Seeds attached to the inner angle of the carpels, sometimes arillate.

Analysis of the Genera.

Flowers 1-sex lal or polygamous; petals none;
(fruit of distinct carpels) 1. Sterculia.

Flowers 2-sexual; potals 5, deciduous.
Ovary long-stipitate; fruit of distinct
twisted carpels 2. Hilloteres.
Ovary on a short gynophore; fruit a
5-valve. capsule 3. Pterospermum.

1. Sterculia, Linn.; G. P. n. 1.

Trees or shrubs. Leaves simple and lobed, or digitate. Flowers polygamous. Calyx tubular, often coloured. Staminal column bearing a ring of sessile anthers. Carpels 5, more or less distinct and follicular, usually on a long gynophore, opening long before ripening. Seeds one or more in each carpel, often winged or arillate.

Analysis of the Species.

Lvs. sharply lobed; follicles woody. . . 1. S. villosa. Lvs. obscurely lobed; follicles membranous . 2. S. pallens.

1. **S. villosa**, Roxb.; Fl. Br. Ind. i. 355; Brandis For. Flora 32, Ind. Trees 80; Gamble Man. Ind. Timb. 94. Vern. Godgudála, Hind.

A moderate-sized deciduous tree with grey bark; branches few, spreading; branchlets stout. Leaves approximate at the ends of the branches, 9-18 in. diam., cordate, nearly glabrous above, tomentose beneath, deeply 5-7-lobed; lobes ovate-oblong, acuminate, entire toothed or cleft; petiole 12-24 in. long, hollow, downy outside; stipules lanceolate, deciduous. Flowers yellow, in much-branched rusty-pubescent drooping panicles which are crowded at the ends of the leafless branches; male flowers the most numerous; bracts linear, caducous. Calyx campanulate, pinkish within, downy outside. Anthers inserted on a membranous ring which is adnate to the short gynophore. Ovary globose. Fruit follicular; follicles 1.5-2.5 in. long, oblong, spreading, coriaceous, rusty-villous, red within; seeds black.

Fairly common in the Don and Sahabanpur Forests, also at Kalsi, generally on sandy or gravelly soil.

Wood very soft and light, about 20 lbs. per c. ft., of no use. The inner bark yields a coarse strong fibre which is made into ropes and is used, either twisted or in broad bands, in dragging timber. A white clear gum exudes from cuts made in the bark which is used medicinally, and is sold in the bazaar under the name of katila.

Leafless Jan.-May. Fl. Mar., Apr. Fr. June, July.

2. S. pallens, Wall.; Sir G. King's Flora of the Malayan Peninsula 182; Brandis Ind. Trees 84; Gamble Man. Ind. Timb. 96. Syn.—S. fulgens, Wall. (partly), Fl. Br. Ind. i. 360; Vern. Khardála, Málköt,

A middle-sized tree with yellowish-grey smooth bark. Leaves 8-12 in. diam., obscurely lobed, coriaceous, scabrid above, covered with dense pale-yellow stellate tomentum beneath; petiole 8-15 in. long, pubescent. Flowers '5-'7 in., in erect panicles, pale-yellow, very downy all over, caducous. Calyx tubular, curved; teeth ovate, acute. Follicles membranous, stipitate, opening long before maturity, rather searce.

MALKOT HILLS, below Mussoorie. Thano Forest in the Dun, and Saiá in Jaunsar;—2,200 to 5,000 ft. Also in shady ravince in the Siwaliks, e.g., Timli and Mohand Passes.

Economic uses similar to those of S. villosa.

Fl. Mar., Apr. Fr. May, June.

2. Helicteres, Linn.; G. P. n. 10.

1. **H. Isora**, Linn.; Fl. Br. Ind. i. 365; Brandis For. Flora 34, Ind. Trees 88; Gamble Man. Ind. Timb. 99. Vern. *Maror-phal*, Hind.; *Kapási*, Saháranpur.

A shrub with thin spreading branhees and grey bark; young parts covered with stellate hairs. Leaves 3-6 by 2-4 in., bifarious. broad-obovate or orbicular, often lobed, obliquely cordate or rounded at the base, short-acuminate, irregularly toothed, scabrous above, pubescent beneath; petiole '2-'4 in. Flowers 1-2 in. long, axillary, usually 2 or 4 together, bracteate; pedicels '2-'5 in. Calyx tubular, '6-'8 in. long, indistinctly 2-lipped, brown-floccose outside. Petuls 5, scarlet, clawed, twice the length of the calyx, reflexed, the two lower ones much larger than the rest; claws winged. Staminal column adnate to the gynophore; anthers 10, on short filaments; staminodes 5, scale-like. Ovary 5-celled, on a gynophore which is elongated in fruit; styles 5, much exserted, more or less connate. Fruit 1.5-'2 in. long, cylindrical, pubescent, composed of 5 spirally twisted carpols; seeds tuberoled.

A very common shrub in the Dún and Saháranpur Forests, especially in coppice areas, generally gregarious; rather scarce in Sál forests.

The branches are used for fenoing and thatch-frames, and the bark yields a strong white fibre. The fruit and leaves are used in Indian medicine.

Fl. Apr.-Aug. Fr. Cold season.

3. Pterospermum, Schreb.; G. P. n. 11.

1. **P. acerifolium**, Willd.; Fl. Br. Ind. i. 368; Brandis For. Flora 35, Ind. Trees 91; Gamble Man. Ind. Timb. 100. Vern. *Máyeng*, Jaunsar.

A large tree with thin grey smooth bark; young branches covered with ferruginous tomentum. Leaves 6-12 by 5-10 in., roundish or ohlong, often lobed, entire or remotely toothed, deeply cordate or peltate, coriaceous, glabrous and deep-green above, grey-tomentose and strongly reticulate beneath, palmately 8-10-nerved from the tip of the petiole; lateral nerves 4-6 pairs; petiole 3-6 in. long,

striate; stipules multifid, caducous. Flowers axillary, solitary or in 2-3-flowered cymes, 5-6 in. diam., fragrant, bracteate; pedicels 5 in. long. Calyx 5-cleft; segments valvate, 3-5 by '3-'5 in., linear, very fleshy, floccosely brown-tomentose outside, villous within. Petals twistedly imbricate, linear, pure white, slightly shorter than the calyx, membranous, deciduous. Filaments 15, 1-1.5 in. long, filiform, in threes opposite to each sepal, with a staminode 2-3 in. long between; the whole staminal whorl forming a tube about 1 in. long below the ovary and adnate to the short gynophore; anthers 15; cells linear, 5 in. long. Ovary oblong, 5-angled, inserted on the top of the staminal column; style undivided, club-shaped. Fruit a capsule, 4-6 in. long, 5-celled, 5-angled, woody, dark-brown, tomentose. Seeds compressed, with large brown membranous wings.

Banks of the Jumna from below Mussoorie to its junction with the Tons, and the Amlawa valley up to near Saia. Very common in the swampy forests of the Eastern Dún about Khairi and Sidhárwála. Frequently cultivated in Dehra.

Growth quick. Sapwood white; heartwood soft of moderately hard, red; weight about 48 lbs. per c. ft. The leaves are lopped for cattle-fodder, and are laid on roofs underneath thatch or slate in Jaunsar; the down of the leaves is used for tinder and to stop bleeding from wounds. A plaster made of the cally is considered infallible in glandular swellings about the neck and cars.

Fl. Mar.-June. Fr. Cold season.

P. lanceæjolium, Roxb.; Fl. Br. Ind. i. 368; is a handsome tree cultivated in gardens at Dehra, and is found wild in the hills of Kumaon. Leaves lanceolate, Flowers 1.5 in. long. Fruit 2-3 in. long, woody.

FAM. 16. TILIACEÆ; G. P. N. 33.

Trees, shrubs, or herbs; bark usually mucilaginous and with strong fibres. Leaves usually alternate, simple or lobed; stipules free. Flowers regular, generally bisexual. Sepals 3-5, free or connate, valvate. Petals as many as the sepals, free, rarely absent. Stamens usually indefinite, free or connate, frequently inserted on a gonophore; anthers introse. Overy free, 2-10-

celled; styles columnar, or parted into as many divisions as there are cells in the ovary; placentation axile. *Fruit* a drupe or a capsule.

1. Grewia, Linn; G. P. n. 8.

Trees or shrubs, more or less stellate-pubescent. Leaves alternate, usually distichous, often inequilateral, variously toothed, with 3-7 basal nerves. Flowers usually 2-sexual, axillary, solitary cymose or panicled. Sepals 5, distinct, coriaceous, coloured inside. Petals 5, usually glandular at the base, sometimes wanting. Stamens indefinite, free, all fertile, inserted on a gonophore when the petals are glandular. Ovary 2-4-celled. Fruit a drupe, more or less fleshy, entire or lobed; lobes 1-or more-seeded.

Analysis of the Species.

•	
Peduncies generally solitary, leaf-opposed;	1. G. oppositifolia.
Peduncles generally fascicled, axillary. Leaves oblong or ovate, more or less	
cordate.	
Drupe fleshy, under '5 in. diam.;	
leaves softly hairy beneath.	
Trees Peduncles scarcely exceed-	
ing the petioles.	
Buds avoid, not ribbed	9 (1
	2. G. vestita.
Buds cylindrical or clavate, rib-	
bed	3. G. asiatica.
An undershrub. Peduncles many	
times longer than the petioles	4. G. sapida.
Drupe crustaceous, about 1 in. diam. :	c. supras.
leaves scabrous	E (7 1 - 1 -11
	5. G. scabrophylla.
Leaves lanceolate, never cordate.	
Leaves glabrescent; drupe rugose,	
2-lobed, black when ripe	8. G. lævigata.
Leaves velvety beneath; drupe shin-	, ,
ing, smooth, 4-lobed, whitish	
when ripe	7 (
amontribo	7. G. polygama.

1. **G. oppositifolia**, Roxb.; Fl. Br. Ind. i. 384; Brandis For. Flora 37, Ind. Trees 95; Gamble Man. Ind. Timb.109. Vern. Biul, Biur, Jaunsar; Bewal, Bhimal, Dún; Behel, Saháranpur.

A moderate-sized tree with whitish bark. Leaves 3-6 by 1.5-3 in., broadly ovate-lanceolate, acuminate, obtusely but closely serrate, scabrous above, pubescent beneath; base unequally rounded, usually 3-nerved (occasionally 3-6-nerved); cross-veins transverse and straight; petiole 2.5 in.; stipules subulate, caducous. Flowers in leaf-opposed umbellate cymes, rarely axillary or terminal; buds cylindrical, pilose. Sepals linear, 6-1 in. long, 3-ribbed, red and smooth inside. Petals linear, shorter than the sepals, white or yellow. Drupe 1-4-lobed, fleshy, dark-green, black when ripe, rough with soattered stiff white hairs.

Fairly common in the Dún, e.g., Tháno, Lachiwála, Phándowála, Ámbári, etc.; more so along the foot of the Samáranpur Siwaliks and in the Pathri Forest. Also found in Jaunsar up to 6,000 ft., often cultivated about villages: Saiá, Dálmigádh, Tons Valley, etc.

It reaches about 40 ft. in height, with a short trunk and a spreading crown. Wood white, weighing 45-50 lbs. per c. ft. It is unpleasantly scented, and is therefore seldom used for fuel. Being tough and elastic, it is used for oar-shafts, axe-handles, banghy-poles, bows, etc. The inner bark yields a fibre which is used for rope and paper-making, and the leaves are much valued for fodder, especially in the Hills. The ripe fruit is eaten.

Fl. Apr.-June, and occasionally in winter in the Saháranpur Forests. Fr. Oct.-Dec.

There seem to be two forms, if not two varieties, grouped under this—one represented by the Saháranpur tree with white petals, and the other by the HILL one which has yellow petals.

2. G. vestita, Wall.; Brandis For. Flora 40, Ind. Trees 98; Gamble Man. Ind. Timb. 110. Syn.—G. asiatica, var. vestita, Wall.; Fl. Br. Ind. i. 387. Vern. Dháman, Hind.

A tree with grey bark; branches and young plants with large white blotches. Leaves 3-5 by 2-3-5 in., obliquely ovate, generally not cordate, acuminate, finintely serrate, sometimes obscurely 3-lobed, pale and softly downy beneath, especially when young; basal nerves 5-6; petiole generally not exceeding '5 in.; stipules linear. Flowers in densely crowded (rarely solitary) axillary cynics; pedunoles '3-4 in. long, hairy, bearing 2-3 bracteolate pedicels; buds ovoid, '15-2 in. long, not ribbed. Sepals slightly pubescent and yellow inside. Petals yellow, much shorter than the sepals. Druge

globose, 2.-3 in. diam., sometimes indistinctly 2.4-lobed, dark-brown or black when ripe.

A very common tree in both Sal and mixed forests of the SIWALIK DIVISION, extending to the SIWALIKS and to the OUTER HIMALAYAN slopes and low-level valleys in JAUNSAR.

Wood grey, tough, elastic, hard and close-grained, used for banghy-poles, bows, spear-handles, etc. Weight about 50 lbs. per c.ft. The branches are lopped for fodder, and the fruit is eaten. The bark yields strong white fibres.

Fl. Apr.-June. Fr. Aug.-Nov.

On comparing a series of specimens collected by me, Mr. Duthie was satisfied that G. elastica, Royle, was quite distinct from G. vestita, Wall., on the grounds that in the former the innovations were dark rusty-tomentose, the petals not glandular at the base, and the leaves very frequently lobed. It occurs only in the HILLS, e.g., above Thadiár. Mr. Haines' investigations, however, went to show that the foregoing characters were by no means constant. It would, therefore, appear to be only a local form of Wallich's G. vestita.

3. G. asiatica, Linn.; Fl. Br. Ind. i. 386; Brandis For. Flora 40, Ind. Trees 98; Gamble Man. Ind. Timb. 111. Vern. Phálsá, Phálsá-Dháman, Hind.

A small or moderate-sized tree; bark dark-grey or greenish-white, longitudinally wrinkled; young parts brown-pubescent. Leaves 4-6 by 3-5 in., obliquely ovate or orbicular, closely and irregularly serrate, densely brown-tomentose beneath; base 5-7 nerved, more or less cordate; petiole 5-1 in., densely rusty-tomentose, thick-ened at the top, rather stout; stipules, linear or subulate. Peduncles generally 2-3, rarely more or solitary, usually shorter than or as long as the petioles; pedicels 2-3, somewhat shorter than the peduncles; buds cylindrical or clavate, generally distinctly ribbed, softly woolly. Sepals: 3-4 in. long, oblong-lanceolate, rusty-floccose outside, orange and glabrous inside. Petals oblong, yellow, half the length of the sepals. Drupe globose, about 4 in. diam., not or indistinctly 2-lobed, pilose, dark-brown when ripe.

Two distinct forms of this plant are met with:—1. a stunted tree with a short trunk, straggling branches and short-petioled more or less orbicular hard leaves, more common about Rámgarh in the Dún; and 2. a middle-sized tree with a large spreading crown and long-petioled somewhat soft ovate leaves, found along the foot of the Saháranpur Siwaliks, especially at Beribárá, and in the Tons and Ámláwa valleys in Jaunsar.

Wood similar to that of *G. vestita*, and is used for the same purposes. The sweetmeat-makers of Saháranpur use the muoilaginous bark to clarify sugar. The fruit is eaten, and the tree is often cultivated for its sake.

Fl. Apr., May. Fr. June-Aug.

4. G. sapida, Roxb.; Fl. Br. Ind. i. 387; Brandis For. Flora 41, Ind. Trees 98; Gamble Man. Ind. Timb. 108. Vern. Bistú. Jaunsar; Phálsá, Hind.

A prostrate undershrub with a perennial woody rootstock throwing out annually a number of switchy shoots, which, after bearing leaves, flowers and fruit, are burnt or browsed down to be renewed next year. Leaves 2-4 by 1.5-3 in., ovate obovate or orbicular, usually doubly serrate, sometimes obscurely lobed, pilose or scabrid above, pubescent beneath; petiole 2-3 in. long; stipules linear. Flowers axillary; pedunoles 2-5 together, 7-1-2 in. long, slender, each 2-5-flowered; buds oblong. Sepals oblong, 2-3 in. long, reddish brown inside. Petals yellow, half the length of the sepals, elliptic, entire. Drupe the size of a pea, slightly lobed.

Open grass-lands up to 3,500 ft. Common in fire-traces and forest paths in the Siwalik Division, also in low valleys in the Hills, e.g. at Thadiar, Bamsu, etc.

A favourite fodder plant. Fruit edible.

Fl. Apr., May. Fr. Oct., Nov.

5. **G. seabrophylia**, Roxb, 7 Fl. Br. Ind. i. 387; Brandis Ind. Trees 99. Syn.—*G. sclerophylla*, Roxb.; Brandis For. Flora 39, Vern. *Gűrbheli*, Dún.

A small shrub 5 to 6 ft. high, apt to be mistaken for a young Helioteres Isora, which it somewhat resembles in foliage. Leaves 4-7 by 3-4 in., ovate or obovate, acuminate, irregularly serrate, ornaceous, scabrous above, pubescent beneath; basal nerves 3-5; petiole 5-7 in. long; stipules subulate. Flowers 7 in. long, white; buds ribbed. Sepals pubescent, more than twice the length of the petals. Petals white, notched. Drupe about 8 in. diam., globose, slightly depressed, with a brown crustaceous and seabrous rind and a scanty pale-yellow viscid sweetish pulp; stones 4.

Common in open grass lands in the Dún and Saháranpur Forests. The stem yields a strong white fibre which can be made into ropes. Fruit edible but not very tasty.

Fl. Apr.-Sept. Fr. Nov.-Mar.

6. G. lævigata, Vahl; Fl. Br. Ind. i. 389; Brandis For. Flora 42, Ind. Trees 96; Gamble Man. Ind. Timb. 111. Vern. Kath Bhemal. Phirsau. Dún.

A small tree; bark dark-brown. Leaves 3-5 by 1.3-2 in. tapering at both ends, acuminate, serrate, glabrescent or with a few scattered hairs, 3-nerved; transverse veins fine; petiole 5 in. long; stipules linear, caducous. Flowers axillary; peduncles 2-3 together, longer than the petiole, each 2-3-flowered. Sepals about 1 in. long, 3-ribbed. Petals white, about one-fourth the length of the sepals, entire. Style longer than the stamens. Drupe 3 in. diam., 1-4-lobed, rugose, black when ripe.

Throughout the Dún in shady localities and in ravines; also in the western half of the Saháranpur Forests, and valleys in the Hills.

The leaves are lopped for fodder.

Fl. June-Sept. Fr. Cold season.

7. G. polygama, Roxb.; Fl. Br. Ind. i. 391; Brandis For. Flora 42, Ind. Trees 100.

An undershrub with a short trunk and bifarious spreading branches. Leaves 2-3 in. long, narrow-lanceolate, sharply serrate, nearly glabrous above, white-tomentose beneath. Flowers polygamous, mostly 1-sexual, on slender axillary peduncles. Stigma stellate. Drupe 5 in. diam., whitish-brown, shining, sometimes with a sew scattered hairs.

In blanks throughout the Dunand Saharanpur Forests, chiefly with sal; also in grass-lands. Pathri Forest. Particularly common in the Siwalik Tracts.

The leaves are browsed by cattle.

' Fl. July, Aug. Fr. Nov., Dec.

To this Family belongs Corchorus olitorius. Linn.; Fl. Br. Ind. i. 397;—which is one of several annual plants of the same Genus, from which the 'jute' fibre is obtained. Stem 8-12 ft. high. Leaves 3-4 in. long, ovate-lanceolate, long-petioled. Flowers yellow. Fruit an elongated capsule, 2 in. long, 10-ribbed. It is found in Dehra, and also in large quantities in the Pathri Forest, Sahāranpur District. The very light soft wood is used for country-made sulphur matches—G. P. n. 18.

DISCIFLORÆ.

Order 1.—GERANIALES.

FAM. 17. LINACEÆ; G. P. N. 34.

Herbs or shrubs. Leaves usually alternate, simple, entire, rarely crenate. Flowers regular, 2-sexual, usually 5-merous. Sepals quite entire. Petals contorted in bud, fugacious, each with a gland inside near the base, adnate to the staminal ring. Stamens 5, often alternating with minute staminodes, or 10, connate at the base into a tube or ring; anthers versatile. Ovary 3-5-celled; styles 3-5, more or less free. Fruit a capsule, splitting into 3-6 cocci.

1. Reinwardtia, Dumort.; G. P. n. 3.

1. **R. trigyna**, Planch.; Fl. Br. Ind. i. 412; Brands Ind. Trees 107; Gamble Man. Ind. Timb. 116. Vern. *Basant*, Dún; *Pengún*, Jaunsar.

A glabrous undershrub, 2 to 3 ft. high or occasionally higher. Leaves 1-4 in. long, narrow-oblong or oblanceolate, narrowed into a slender petiole, usually entire and mucronate, membranous. Flowers about 1 in. long, in axillary or terminal cymes or panicles, sometimes solitary. Sepals 5, green, lanceolate, acuminate. Petals 5, brightyellow, obovate, about 1 in. long. Styles usually 3, more or less connate below. Capsule the size of a pea, papery.

Very common in the Dun and the Hills up to 6,000 ft., growing fairly large if not too much browsed.

Fl. Feb.-Apr. Fr. Apr.-June.

FAM. 18. MALPIGHIACEÆ; G. P. N. 36.

Climbing or suberect shrubs. Leaves opposite, simple, entire, usually exstipulate. Flowers regular or

irregular, bisexual, pentamerous, white or yellow, in axillary or terminal panicles. Calyx deeply 5-partite, usually with a large gland outside. Petals free. Disk obscure. Stamens 10, hypogynous, equal or unequal; filaments free or connate below. Ovary free, 3-celled, 3-lobed; cells 1-ovuled; styles 1-3. Fruit of 1-3 samaras. Seeds exalbuminous.

Analysis of the Genera.

Calyx glandular; style 1; carpels winged only at the end 1. HIPTAGE.

Calyx eglandular; styles 3; carpels winged all round 2. ASPIDOPTERYS.

1. Hiptage, Gærtn.; G. P. n. 34.

1. H. Madablota, Gærtn.; Fl. Br. Ind. 148; Brandis For. Flora 44, Ind. Trees, 108; Gamble Man. Ind. Timb. 118. Vern. Anetá, Dún; Madh Málti, Hind; Mádhavilatá, Sans.

A large evergreen climbing shrub. Leaves 4-6 by 1.5-2.5 in., oblong or ovate-lanceolate, acuminate, entire, coriaceous, glabrous; main lateral nerves 4-6 pairs, arcuate, base acute, rarely rounded; petiole 2-5 in. long; stipule 0. Flowers showy, fragrant, in large terminal and smaller axillary panieles. Calyx with a large oblong gland outside; segments 2 in. long, imbricate, pubescent. Petals 5-7 in. long, unequal, silky, elawed, fimbriate, 4 white, 1 yellow. Stamens 10, one much larger than the rest. Style 1, filiform. Fruit of 1.3 samaras; wings 3, obovate or oblanceolate, one large about 2 by 5 in., two small about 1 by 2 in.

Common in ravines and moist places in the Dún, e.g., the Bindál nálá, Kuáwála, Nakraunda, Nágsidh, Karwápáni, etc.; also at Kálsi.

The woody stem is used for fuel.

Fl. Feb.-Apr. Fr. May, June.

2. Aspidopterys, A. Juss.; G. P. n. 37.

1. A. Wallichii, Hook. f.; Fl. Br. Ind. i. 421; Brandis Ind. Trees 110; Gamble Man. Ind. Timb. 118. Syn.—A. nutans. A. Juss.; Brandis For. Flora 45. Vern. Jugter, Malköt.

A climbing shrub; branches slender, white-pubescent. Leaves usually opposite,* sometimes in whorls of three, 3-5 by 2·5·3·5 in., ovate oblong or orbicular, acuminate, glabrescent above, white-tomentose beneath; main lateral nerves 4-5, arcuate; base subcordate or rounded; petiole ·5·7 in. long. Panicles large, pendulous, terminal but running down among the leaves below so as to appear partly axillary; pedicels rather stout, with very minute bracteoles. Flowers white or cream-colour, about ·2 in. across. Calyx glandular, minute. Petals 5, equal, entire, not clawed, 3 or 4 times the length of the calyx. Stamens 10, all fertile. Ovary white-tomentose; styles 3, glabrous. Fruit of 1-3 samaras; wings variable, usually orbicular-oblong, 1-1·5 in. long; nucleus without crest or wing.

Hedges and open forest lands throughout the SIWALIK DIVISION, and the OUTER HIMALAYA;—very conspicuous in fruit.

Fl. Aug., Sept. Fr. Nov., Dec.

Very similar in appearance, but with larger and less tomentose leaves which are not cordate, larger panicles and somewhat larger flowers—is Aspidopterys nutans, Hook. f.; Fl. Br. Ind. i. 421, Syn.—A. lanuginosa. A. Juss.; Brandis For. Flora 44,—occurring in much the same localities. Common towards Ráipur in the Dún.

FAM. 19. RUTACEÆ; G. P. N. 39.

Trees or shrubs, rarely herbs, usually aromatic. Leaves alternate, compound, rarely opposite or simple, exstipulate, usually with translucent glandular dots. Flowers regular, in cymes corymbs or panicles, rarely solitary. Calyx of 4-5 small imbricate lobes. Petals as many as the calyx-lobes, usually hypogynous. Stamens as many or twice as many as the petals, rarely more, with an annular or cylindrical disk within; anthers 2-celled, often versatile. Ovary of 4-5 free or connate carpels; styles 1-5, usually free. Fruit a berry, less frequently capsular or drupaceous.

There is a specimen in the College Herbarium with leaves distinctly alternate, which is quite exceptional in the Family.

Analysis of the Genera.

Armed. Scandent shrubs. Fls. polygamous; style 1 2. TODDALIA. Erect shrubs or trees.* Flowers 1-sexual; styles 2-5; fruit of 1. ZANTHOXYLUM. capsular carpels . Flowers 2-sexual; style 1; fruit a berry. Leaves 3-foliolate or imparipinnate; 6. LIMONIA. pericarp pulpy. Leaves 1-foliolate; pericarp leathery. 9. CITRUS. Leaves 3-foliolate; pericarp woody . 10. ÆGLE. Unarmed. Flowers polygamous; petals valvate. Trees. Leaves 1-(rarely 3-) foliolate, thin: stamens 8. 3. ACRONYCHIA. A small shrub. Leaves simple. fleshy: 4. SKIMMIA. stamens never more than 5 . Flowers 2-sexual; petals imbricate. Leaves 1-5-foliolate; style persistent. (Flowers panioled; filaments subu-5. GLYCOSMIS. Leaves imparipinnate; style deciduous. Flowers corymbose or solitary; ovary usually 2-celled 7. MUBRAYA. Flowers usually in terminal panicles; ovary 4-5-celled 8. CLAUSENA.

1. Zanthoxylum, Linn.; G. P. n. 51.

1. **Z. alatum**, Roxb.; Fl. Br. Ind. i. 493; Brandis For. Flora 47, Ind. Trees 116; Gamble Man. Ind. Timb. 121. Vern. *Timbur*, *Timru*, *Temru*, Jaunsar; *Tejbal*, Hind.

A shrub or small tree with corky bark, and strong prickles on the branches, petioles and midrib of the leaflets; branchlets often rough with raised grey specks. Leaves alternate, imparipinnate, common petiole and rachis narrowly winged. Leaflets 2-6 pairs, opposite. sessile, 1-3 by '3-'8 in., elliptic-lanceolate, more or less serrate, obtusely acuminate, pellucid-punctate. Flowers small, yellow, usually 1-sexual, in dense lateral panicles. Calyx 6-8-fid. Petals none. Stamens 6-8, much exceeding the oalyx; anthers large. Fruit usually of a solitary carpel which dehisses ventrally, of the size of a peppercorn, tubercled, strongly aromatic.

^{*} Some species of Zanthoxylum, not found within the limits of this Fiors are scandent.

Hot valleys and in forest undergrowth up to 6,000 ft. in JAUNSAR, TEHRI-GARHWAL and the OUTER-HIMALAYA. Above Rájpur; Dharmigádh, Tons and Bámsu Valleys; Korwá, Koti Forest, etc.

Wood close-grained, heavy, hard, and of a yellow colour (whence the generic name), used for walking-sticks. Tooth-brushes are made of the branchlets, which and also the aromatic fruit are good for toothache. The fruit is also used as a condiment and to purify water. The bark is used to intoxicate fish.

Fl. Apr.-June. Fr. Aug.-Oct.

V2. Toddalia, Juss.; G. P. n. 62.

l. **T. aculeata**, Pers.; Fl. Br. Ind. i. 497; Brandis Ind. Tree 119; Gamble Man. Ind. Timb. 123. Vern. Kánj, Hind.

A large prickly scandent shrub, even old stems bearing curved prickles with a large conical corky base. Leaves alternate, usually 3-foliolate. Leaflets sessile, 2-4 by '7-1-5 in., obovate elliptic or oblanceolate, crenulate, glabrous, more or less coriaceous, with many straight lateral nerves. Flowers polygamous, in axillary ownes or less frequently in terminal panieles, '2 in. diam., pale-yellow. Calyx usually 5-lobed, pubescent outside. Petals 5, imbricate. Stamens generally 5, longer than the petals in the male flowers, imperfect or 0 in the female flowers; anthers round. Ovary 5-celled. Fruit globose, the size of a large pea, shallowly 5-grooved or -lobed; seeds reniform.

In swampy places or deep open ravines in the Don, e.g., Kaluwala, Nakraunda, Mothronwala, Bindal nala, etc.

The bark of the roots gives a yellow dye, and a bitter aromatic tonic which is used as a remedy for fever.

Fl. Feb.-Apr. Fr. July-Sept.

3. Acronychia, Forst.; G. T. n. 67.

1. A. laurifolia, Bl.; Fl. Br. Ind. i. 498; Brandis Ind. Trees 116; Gamble Man. Ind. Timb. 124.

A tree. Leaves usually 1-foliolate, subopposite or crowded at the ends of the branches. Leaflets variable, 3-6 by 1.5-3 in., ellipticoblong obovate or oblanceolate, quite entire, glabrous, sometimes obtusely acuminate, more or less aromatic; base acute; lateral nerves 12-15 pairs; petiolule 5-1 in. long. Cymes axillary, triohotomous

corymbose; peduncles 3-4 in. long, slender. Flowers whitish, fragrant; buds oblong. Calyx 4-lobed; lobes small, rounded. Petals 4, valvate, '2 in. long, oblong, with a broad base, more or less villous inside. Stamens 8, alternately longer; filaments subulate, bearded below. Ovary 4-celled, hairy, sunk in the disk. Fruit a drupe, '3-4 in. diam., slightly lobed or grooved; seeds black.

Occurs but rarely in the Dun.-Mothronwala swamp.

Wood white, fine- and close-grained, but liable to crack; weight about 42 lbs. per c. ft. Old stems sometimes with irregular patches of brown mottled harder wood inside, which however is not the true heartwood.

Fl. May-July. Fr. Nov.-Jan.

4. Skimmia, Thunb.; G. P. n. 68.

1. **S. Laureola,** Hook f.; Fl. Br. Ind. i. 499; Brandis For. Flora 50, Ind. Trees 116; Gamble Man. Ind. Timb. 124. Vern. Kathúr-chará, Gurlpatá, Jaunsar.

A strongly aromatic small evergreen shrub; bark white. Leaves 4.6 by 8.1.5 in., alternate, simple, oblanceolate or obovate, acute or acuminate, coriaceous, rather succulent, quite entire, glabrous, gland-dotted, crowded at the ends of the branches; midrib stout; nerves indistinct; petiole 1.3 in., flattened above. Flowers polygamous, yellow, 3.5 in. diam., in compact terminal panicles. Calyx 4.5. lobed, imbricate. Petals 4.5, oblong, valvate. Stamens 4.5, hypogynous; filaments stout, subulate. Ovary 2.5 celled; style 1. Fruit an ovoid or subglobose fleshy drupe, 5.7 in. long, red when ripe, with 2.5 1-seeded stones.

A common undershrub in shady localities in the HILLS 6,-10,000 ft., generally in dense gregarious patches. "The odour of the musk-deer Kastúrá is popularly supposed to be derived from it."—Mr. A. Smythies.

Fl. Apr., May. Fr. July-Sept.

5. Glycosmis, Correa; G. P. n. 71.

\ 1. G. pentaphylla, Correa; Fl. Br. Ind. i. 499; Brandis For. Flora 49, Ind. Trees 112; Gamble Man. Ind. Timb. 125. Vern. Ban Nimbú, Hind.

A small evergreen shrub. Leaves alternate, usually 1-5-foliolate; petiole and rachis stout. Leafets very variable in size and

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shape, usually 4-6 by 1.5-2 in., ovate lanceolate or obovate, entire or obscurely crenulate, dark-green, quite glabrous. Flowers white, fragrant, in axillary or terminal panieles. Calyx 4-5-fid; segments broad. Petals 4-5, white, imbricate. Stamens 8-10, free; filaments dilated below. Ovary 2-5-celled; style short, persistent. Fruit a globose or depressed berry, pink or bluish-white when ripe, with an aromatic sweetish pulp.

Forms a thick undergowth in shady moist evergreen forests in the Dún, e.g., Khairi, Kánsráo, Nakraunda and Káluwála ; also at Kálsi.

The wood is tough and hard, but is seldom found of a utilizable size. It makes a good hedge-plant, for which purpose it is often planted. The twigs are used as tooth-sticks. The ripe fruit is eaten, and the roots are used in country medicine.

Fl. and Fr. throughout the year.

6. Limonia, Linn.; G. P. n. 75.

1. L. aoidissima, Linn.; Fl. Br. Ind. i. 507; Brandis For. Flora 47, Ind. Trees 118; Gamble Man. Ind. Timb. 127.—Syn. L. crenulata, Roxb.; Duthie Fl. Up. Gang. Pl. i. 39. Vern. Beli, Hind.

A large spinous shrub or small tree with white or ash-coloured corky bark. Leaves alternate, imparipinnate, 3-6 in. long; petiole and the rachis between each two pairs of leaflets winged to the size and shape of leaflets. Leaflets 5-9, '5-1'5 in. long, quite sessile, ovate-rhomboid or ovate-lanceolate, acuminate, crenulate, gland-dotted; base cuneate. Flowers 4-merous, white, fragrant, in short axillary often leaf-bearing racemes. Calyx 4-partite, small. Petals 4, elliptic or oblong, much larger than the calyx-segments. Stamens 8, inserted round an annular or columnar disk. Ovary 4-celled; cells 1-ovuled; style short, deciduous. Fruit a globose berry, '3-'4 in. diam., fleshy, black when ripe, exceedingly acid (whence the specific name).

Common in the Eastern Dún and western half of the Sahá-Banpur Siwaliks: Tháno, Lachiwála, Barkálá, etc.

Wood cream-coloured, hard and close-grained, capable of employment as a substitute for box-wood, but chiefly used for fuel; walking-sticks are made of the branches. "The pulp of the fruit is considered protective against contagion, and an antidote to venomous poisons"—Sir D. Brandis.

Fl. Apr., May. Fr. Cold season.

7. Murraya, Linn.; G. P. n. 76.

Unarmed shrubs or small trees. Leaves alternate. imparipinnate. Leaflets alternate, petioluled. Flowers 2-sexual, cymose or corymbose. Calyx 5-fid. Petals 5, imbricate. Stamens 10, the alternate shorter; filaments, subulate; anthers short. Ovary usually 2-celled; style simple, long, articulated, deciduous. Fruit a berry.

Analysis of the Species.

An evergreen shrub. Leaflets 3-9; fruit red when ripe

1. M. exotica. A deciduous shrub. Leaflets 9-25; fruit

- 2. M. Kanigii. black when ripe. 1. M. exotica. Linn.; Fl. Br. Ind. i. 502; Brandis For.
- Flora 48, Ind. Trees 113; Gamble Man. Ind. Timb. 125. Vern. Bilgár, Dún : Márchulá, Garhwal.

An evergreen shrub or small tree with thin grey corky bark. Leaves dark-green, glabrous, 3-8-foliolate. Leaflets 1-3 by 5-1 in., obliquely rhomboid, more or less acuminate, entire, shining above, coriaceous when mature; petiolule 'l in. long. Flowers 1 in. long. white, very fragrant, in terminal or axillary corymbs, sometimes solitary. Sepals minute, acute, dotted. Petals oblong-lanceolate. Ovary linear, 2-celled. Berries 5-7 in. long, narrowed at both ends, 2-seeded, rugose, red or deep orange when ripe.

Cool shady ravines in the Dun and Outer Hills, and along raus in the Saharanpur Stwaltes.

Wood close-grained, hard, light-yellow, capable of being used for wood-engraving; weight 62 lbs. per c. ft. Handles of implements and walking-sticks are made of it, and the twigs are used for tooth-brushes. It is often planted as an ornamental shrub.

- Fl. Mar.-Sept. but often throughout the year. Fr. Oct.-Feb.
- 2. M. Keenigii, Spreng.; Fl. Br. Ind. i. 503; Brandis For. Flora 48, Ind. Trees 113; Gamble Man. Ind. Timb. 126. Vern. Gandhelá, Dún; Káth Ním, Hind.

A deciduous shrub with thin dark-brown bark. Leaves 6-12 in. long; rachis terete, pubescent. Leaflets 10-25, 1-2 in. long, ovate or lanceolate, oblique at the base, obtusely acuminate or retuse, subentire or irregularly crenulate; petiolule 'l in. Flowers ·3.·5 in. long, white, in terminal corymbose panicles. Sepals small, acute. Petals oblong, dotted. Ovary 2-celled. Fruit subglobose, ·3 in. diam., rugose, black when ripe.

A common undershrub in the Dún and Saháranpur Forests, generally in ravines and on waste lands. Often gregarious under Khair and Sissu in dry beds of streams in the Dún, e. g., near Kánsráu.

Wood even-grained, hard and durable, capable of being used for agricultural implements. The fresh leaves have a fetid smell, but give an agreeable flavour to curries, and are much used for this purpose in Southern India where it is known as the Curryplant.

New leaves Mar., Apr. Fl. Apr., May. Fr. Cold season.

8. Clausena, Burm.; G. P. n. 77.

1. C. Wampi, Blanco; Fl. Br. Ind. i. 505; Brandis Ind. Trees 114; Gamble Man. Ind. Timb. 127. Vern. Am-pich, Dún.

A sweet-scented evergreen tree. Leaves alternate, imparipinnate; petiole and rachis terete. Leaflets 5-9, 3-5 by 1.7-3 in., ovate elliptic or lanceolate, oblique, shining above, margins wavy or crenulate; petiolule '2-'3 in. long. Flowers 2-sexual, small, white, 4-5-merous, in large compound terminal panicles; inflorescence rusty-tomentose. Calyx 4-5-fid. Petals 4-5, imbricate, concave. Fruit a 1-seeded globose drupe, '6-'8 in. diam., with a tough glandular rind.

Cultivated in the D $\acute{\text{u}}$ n for its fruit and as an ornamental plant.

Fl. Mar., Apr. Fr. June, July.

C. pentaphylla, DC.; Fl. Br. Ind. i. 503. Vern. Ratanjöt, Hind.—has been found in the neighbourhood of Beribára and Dholkhand in the SIWALIK DIVISION. It is a small undershrub with rough coriaceous pinnate leaves and large aromatic leaflets.

9. Citrus, Linn.; G. P. n. 81.

1. C. medica, Linn.; Fl. Br. Ind. i. 514; Brandis For. Flora 51, Ind. Trees 123; Gamble Man. Ind. Timb. 130. The Lemon or Lime. Vern. Nimbú, Hind.

A shrub or small tree with strong axillary spines; bark greenish-grey, smooth. Leaves 1-foliolate; petiole 3-5 in. long, often winged. Leaflets 3-6 by 1-2-5 in., elliptic or ovate-lanceolate, entire

or more or less serrate, coriaceous, glabrous. Flowers often 1-sexual :5-1 in. long, white, sweet-scented, in axillary cymes or solitary; pedicels :3-:5 in. long, stout. Calyx cup-shaped, 3-5-toothed or entire Petals 4-8, imbricate, :6-:8 in. long, oblong, fleshy, with large glandular dots, often tinged pink outside. Stamens 20-40, round a large disk; filaments variously connate. Ovary many-celled; ovules 4-6 in each cell; style deciduous; stigma lobed. Fruit 2-4in. long, ovoid oblong or globose, with a thick or thin rind which is generally yellow when ripe; pulp cellular and juioy, usually acid.

Indigenous in damp localities in the Døn, e.g., Nakraunda, Káluwála, Jogiwála, etc. Several varieties with acid or sweet juice are cultivated in gardens. The wood is tough and close-grained, and makes good walking-sticks.

Fl. Apr., May. Fr. Nov., Dec.

The following species are also cultivated in gardens in the Don:—

- 1. C. Aurantium, Linn.; Fl. Br. Ind. i. 515; Brandis Ind. Trees 123.—The Orange. Vern. Nárengi, Hind., of which there are several varieties, distinguishable from C. medica by pure-white 2-sexual flowers, and the characteristic colour and shape of the fruit.
- 2. C. decumana, Linn.; Fl. Br. Ind. i. 516; Brandis Ind. Trees 123. The Shaddook or Pumelo. Vern. Chakutará, Hind., a tree with large leaves, pubescent beneath; petiole broadly winged. Flowers large, white, strongly scented. Fruit 6-8 in. diam., globose or pyriform, with a thick spongy rind.

10. Ægle, Correa; G. P. n. 83.

1. **AE. Marmelos**, Correa; Fl. Br. Ind. i. 516; Brandis For. Flora 57, Ind. Trees, 119; Gamble Man. Ind. Timb. 131. The Bael tree. Vern. Bel, Bill, Bael, Hind.; Vilva, Sans.

A glabrous deciduous tree with grey corky bark and sharp straight axillary spines about 1 in. long. Leaves alternate, 3-foliolate, with a resinous odour; common petiole 1-2·5 in. long, terete. Leaflets 2-4 by 1-2·5 in., ovate-lanceolate or rhomboidal, acuminate, crenate, gland-dotted, the lateral sessile or with a petiolule about 1 in. long; terminal petiolule ·5·1 in. long, flattened above. Flowers greenishwhite, about 1 in. diam., sweet-scented, in short lateral panieles. Calyx small, obscurely 4-5-toothed, pubescent, deciduous. Petals 4-5, imbricate, oblong, gland-dotted. Stamens numerous; filaments

short, subulate, often fascicled; anthers long, narrow. Ovary 8-20-celled; ovules many in each cell; style short; stigma deciduous. Fruit 2-7 in. diam., with a smooth grey or yellow woody shell, and a mass of sweet yellow aromatic mealy pulp.

Common in the Eastern Dún and Sahábanpur Siwaliks, e. g., Rikhikesh; Lachiwála; Ránipur, etc. Often cultivated for its fruit, and as a sacred tree.

Wood even- and close-grained, tough and strong, but liable to split badly in seasoning; weight 50-60 lbs. per c. ft. It is used in construction. The pulp of the ripe fruit is a laxative, and mixed with a little milk and sugar makes a very agreeable cooling sherbet. The unripe fruit, either boiled or roasted, is used as a specific for diarrhosa and dysentery. The pulp is also used to strengthen mortar. The mucus with which the cells of the fruit are filled is used for adhesive purposes, and is often mixed with water-paints to add to their strength and brilliancy. Snuff-boxes are made of the shell of the fruit. The leaves are very bitter and are used as a febrifuge; they are also lopped for cattle fodder. They are considered indispensable for the worship of the god Shiva, and the wood is one of the few that are prescribed by the Hindu scriptures for sacrificial fires.

Fl. Mar.-May. Fr. Mar.-June (next year).

FAM. 20. SIMARUBACEÆ; G. P. N. 40.

Trees or shrubs with bitter bark. Leaves alternate, pinnate, usually exstipulate. Flowers in axillary panicled cymes, small, regular, generally unisexual. Calyx 3-5-lobed, valvate or imbricate. Petals 3-5. Disk entire or lobed, rarely 0. Stamens as many or twice as many as the petals, hypogynous, inserted at the base of the disk; filaments free. Ovary 1-6-celled, usually deeply lobed or with distinct carpels. Fruit drupacious or samaroid, rarely baccate or capsular. Seeds usually albuminous.

1. Picrasma, Bl.; G. P. n. 12.

1. P. quassioides, Bennett; Fl. Br. Ind. i. 520: Brandis For. Flora 59, Ind. Trees 127; Gamble Man. Ind. Timb. 133. Vern. Karúi, Tithái, Jaunsar.

A large shrub with bitter bark; branches few, stout, usually with white specks. Leaves lyrately imparipinnate, 9-15 in, long. rusty-tomentose. Leaflets 9-15, generally 3-4 by 1-1.5 in., the lowest pair smallest and the penultimate pair largest, sub-opposite. ovate or oblong-lanceolate, long-acuminate, serrate, membranous. nearly glabrous when mature; petiolule of lateral leaflets '05-'08 in... of the terminal leaflet, 5-1 in. long. Flowers 1-sexual or polygamous. 2 in. across, pale-green, in axillary panicles. Calyx 4-5-lobed. Petals 4-5. valvate, enlarged and corraceous in fruit. * Stamens 4-5; filaments with a thick hairy base; anthers versatile. Fruit a drupe. 2-3 in. diam., black when ripe. Seeds albuminous.

OUTER HIMALAYA above Rájpur, also in shady ravines in JAUNSAR and TEHRI-GARHWAL, 5,-8,000 ft.: Deoban, Bámnáigádh. Mundáli; Deotá; banks of the Rúpin, etc. Not very abundant.

Wood cream-colour, light, fine- and close-grained. The bark has the same properties as quassia, and is used as a tonic in Indian medical practice.

Fl. Apr.-June. Fr. July-Sept.

FAM. 21. BURSERACEÆ; G. P. N. 42.

Resinous trees or erect shrubs. Leaves alternate. imparipinnate, usually exstipulate. Flowers regular, small, 2-sexual or polygamous. Calyx free, 3-7-lobed. often minute. Petals 3-7, usually distinct. Disk annular or cup-shaped, free or adnate to the base of the calyx. Stomens as many or twice as many as the petals: filaments free. Ovary 2-5-celled; ovules axile, 2-5 in each cell; style single. Fruit usually a drupe, rare ly dehiscent. Seeds exalbuminous.

Analysis of the Genera.

Leaflets sessile; fruit 3-gonous, pericarp woody 1. Boswellia.

Leaflets petioluled; fruit globose, pericarp fleshy 2. Garuga.

1. Boswellia, Roxb.; G. P. n. 1.

1. **B. serrata**, Roxb.; Fl. Br. Ind. i. 528; Brandis Ind. Trees 129; Gamble Man. Ind. Timb. 137. Syn. *B. thurifera*, Coleb.; Brandis For. Flora 61. Vern. *Salái*, *Salár*, Hind.

A gregarious deciduous tree; bark reddish-yellow or greenish-grey, smooth, peeling off in thin papery flakes; young parts pubescent. Leaves exstipulate, pubescent, crowded at the ends of the branches; rachis stout, 10-15 in. long. Leaflets 8-15 pairs (besides the odd one), sub-opposite, sessile or less frequently minutely petioluled, 2-3 by 3-6 in., lanceolate or linear, coarsely serrate, unequal-sided; tip rounded, sometimes mucronate. Flowers small, white, in axillary or sub-terminal fasoicled racemes. Calyx 5-7-cleft, persistent. Disk annular, red, crenate. Petals 5-7, imbricate, broad-ovate. Stamens 10; anthers hairy. Ovary 3-celled. Drupe 5-7 in. long, 3-gonous; carpels 1-seeded, at length separating septifragally; endocarp heartshaped, bony, beaked, surrounded by a membranous wing.

Throughout the Saháranpur Siwaliks, all by itself on steep sandy slopes, but in a mixed state on gentler slopes.

Sapwood large, rough-grained, soft and perishable, weight 20-35 lbs. per c. ft. An irregular-shaped mass of dark-brown mottled heavy wood is often found in the centre of large trees, which may be the heart-wood or perhaps a kind of ebony, quite capable of being used for ornamental purposes. The charcoal is used for iron smelting in the Central Provinces. A transparent gum-resin exudes from wounds and cracks in the bark, which is used in medicine, and also burnt as an incense.

Leafless Mar.-June. Fl. Apr., May. Fr. July, Aug.

2. Garuga, Roxb.; G. P. n. 3.

1. G. pinnata, Roxb.; Fl. Br. Ind. i. 528; Brandis For. Flora 62, Ind. Trees 131; Gamble Man. Ind. Timb. 138. Vern. Kharpát, Hind.

A large deciduous tree; bark grey or brown, exfoliating in hard round flakes, red inside. Leaves exstipulate, 9.15 in. long. Leaflets 5-9 pairs besides the terminal one, opposite, 2-4 by 1-1.5 in., oblong-or ovate-lanceolate, crenate, caudate-acuminate, more or less pubescent; petiolule 1.-2 in. long. Flowers polygamous, yellow, in large terminal panicles; panicles 8-10 at the end of each branch, tomentose. Calyx campanulate, green; segments 5, valvate. Petals 5, linear, induplicate-valvate, alternating with the calyx-segments. Disk large, clothing the calyx-tube. Stamens 10; filaments hairy. Ovary 4-5-celled, hairy. Drupe globose. 5-7 in. diam.

A very common tree in the Dún and Saháranpur forests generally with Sál, but not uncommon in scrub forests and glades.

Wood soft and light and is chiefly used for fuel, but is much prized for house-posts in Eastern Bengal for its durability. The leaves are lopped for camel-fodder. The tree can be easily propagated by cuttings, and is occasionally thus planted in hedgerows.

Leafless Dec.-Apr. Fl. Apr., May. Fr. Oct., Nov.

FAM. 22. MELIACEÆ; G. P. N. 43.

Trees or shrubs with bitter bark and leaves. Leaves alternate, exstipulate, usually pinnate, rarely 2- or 3-pinnate or simple; leaflets more or less oblique at the base. Flowers 2-sexual, regular, generally a large proportion sterile. Calyx 3-6-lobed. Petals 3-6, usually free. Stamens as many as the petals, or more frequently twice as many; filaments usually connate into a tube; anthers often sessile on the tube. Disk hypogynous, often forming a second tube inside the staminal tube. Ovary free, 3-5-celled; style simple. Fruit a drupe or a capsule. Seeds albuminous in the local species.

Analysis of the Genera.

Stamens united into a tube; fruit a drupe; seeds not winged.

Leaves only once pinnate; drupe 1-celled . 1. AZADIRACHTA. Leaves 2- or 3-pinnate; drupe 5-celled . 2. Melia.

Stamens free; fruit a capsule; seeds winged

. 3. CEDRELA.

1. Azadirachta, A. Juss., G. P. n. 7.

1. A. indica, A. Jussieu; Brandis Ind. Trees 139.—Syn. Melia indica, Juss.; Brandis For. Flora 67; Gamble Man. Ind. Timb. 143. M. Azadirachta, Linn., Fl. Br. Ind. i. 544. The Neem tree. Vern Nim, Hind.

A large handsome tree. Leaves imparipinnate, 9-15 in. long, glabrous. Leaflets 9-15, subopposite, 2-4 by '5-1 in., lanceolate or ovate-lanceolate, very unequal-sided, often falcate, deeply serrate, very gradually acuminate, bright-green and shining above, subsessile or with a minute petiolule. Flowers white, scented, in numerous axillary panicles which are shorter than the leaves; branches of panicles and pedicels very slender. Calyx small, flat; segments 5, rounded. Petals about '2 in. long, spathulate, ciliate. Anthers 10, inserted inside the staminal tube. Ovary 3-celled. Drupe '5-'7 in. long, ovoid-oblong, 1-celled, smooth, greenish-yellow when ripe.

Fairly common along the foot of the Saháranpur Siwaliks and some distance in the interior, especially from Kasúmri to Hardwar, unmistakably wild, if not indigenous. Cultivated for shade and ornament in the Dón and Saháranpur Districts, as also throughout the greater part of India.

Sapwood grey; heartwood dark-red, very hard; weight about 50 lbs. per c. ft. It is used in construction and for furniture, and makes good sonorous drums. It is one of the woods held sacred by the Hindus, and idols are made of it. The bark, leaves and fruit are used in medicine. The fruit gives an oil which is considered very good for small-pox sores and is also used for burning. The leaves are much lopped for goat and camel fodder.

Fl. Mar., Apr. Fr. July, Aug.

2. Melia, Linn.; G. P. n. 7.

1. M. Azedarach, Linn.; Fl. Br. Ind. i. 544; Brandis For. Flora 68, Ind. Trees 140; Gamble Man. Ind. Timb. 144. The Persian Lilac. Vern. Bakáin, Dék, Dún; Deknoi, Jaunsar.

A moderate-sized tree with smooth dark-grey bark. Leaves bipinnate, sometimes tripinnate, 9-18 in. long; pinnæ usually opposite. Leaflets 3-7 in each pinna or pinnule, '5-1'5 in. long, ovate-lanceolate, serrate, acuminate, the lateral more or less oblique; petiolule 0-'2 in. Flowers lilac-blue, in numerous axillary oyme-bearing panicles; peduncles 3-4 in. long. Calyx deeply 5-lobed. Petals 5, '2-'3 in. long, linear-oblanceolate. Staminal tube purple, '2 in. long, cylindrical, with 20-30 linear teeth; anthers at the mouth of the tube. Ovary 5-celled. Drupe about '5 in. diam., globose, generally 5-celled and 5-seeded, more or less dry, yellow when ripe, at first quite smooth, afterwards wrinkled, remaining on the tree long after ripening.

Very common in cultivation in Dehra Dén and Saháranpur; also in hot valleys in Jaunsar,— doubtfully wild.

The tree grows very fast and coppies extremely well. Heartwood reddish-brown, takes a good polish, and is sometimes used for furniture. "The bark is extremely bitter, and is employed as an anthelmintic. The fruit yields an oil, and the nuts are frequently strung as beads. The leaves and pulp of the fruit are used in native medicine."—Mr.J.S. Gamble. The leaves are also lopped for fodder.

Leafless Dec.-Mar. Fl. Mar.-May. Fr. Cold season.

3. Cedrela, Linn.; G. P. n. 35.

Deciduous trees. Leaves pinnate; leaflets opposite or subopposite. Flowers small, in large axillary and terminal panicles. Calyx small, 5-fid. Petals 5, imbricate, keeled inside at the base. Disk thick, 4-6-lobed. Stamens 4-6, free, inserted on the top of the disk; filaments subulate; anthers oblong, versatile. Ovary 5-celled; style simple; ovules 8-12 in each cell, in two series. Fruit an oblong or ovoid capsule, septifragally 5-valved. Seeds numerous, flat, winged.

Analysis of the Species.

Leaflets entire; panicles scarcely exceeding the leaves; seeds winged at both ends. 1. C. Toona. Leaflets serrate; panicles much exceeding the leaves; seeds winged only at the apex 2. C. serrata.

1. C. Toona, Roxb.; Fl. Br. Ind. i. 568; Brandis For. Flora 72, Ind. Trees 145; Gamble Man. Ind. Timb. 157. The Toon tree. Vern. Tún. Hind.

A large tree with a dense spreading crown and thin dark-grey bark which is smooth up to middle age. Leaves paripinnate, 1-2 ft. long, generally glabrous. Leaflets 8-30, usually opposite, 2-6 by 7-2-5 in., lanceolate or ovate-lanceolate, acuminate, sometimes pubescent beneath; margins entire, usually wavy; base acute, somewhat oblique; petiolule '3-'7 in. long, slender. Flowers cream-coloured, scented like honey, in ample drooping panicles. Calyx short; lobes ciliate. Petals '15-'2 in. long, free, oblong or ovate, ciliate. Disk hairy at the orange-coloured lobes. Stamens 5, inserted on the lobes of the disk. Stigma capitate, with a large depression at the apex. Capsule septifragally dehiscent, '7-1 in. long by '2-'3 in. diam., oblong or oblanceoloid, dark-brown. Seeds reddish-brown, light, with a membranous wing at either end, about '5 in. long including the wings.

DÚN and SAHÁRANPUR FORESTS and valleys in the IHILLS up to 3,500 ft., generally along the banks of streams or in marshy localities, e.g., Káluwála, Rámgarh, Jogiwála; scarce with Sál. Largely planted in avenues, along canals, and in gardens.

Toon is a fast-growing species, attaining a girth of 60 inches in little more than 30 years. Trees 70-80 ft. in height and 8-10 ft. in girth are not at all uncommon. The heartwood is red, seasons well, takes a fine polish, and is easy to work. It is durable and is not eaten by white ants. Weight about 40 lbs. per c. ft. It is the chief furniture-wood of Dehra Dun and the adjoining districts. The leaves are sometimes lopped for fodder. A sulphur-coloured dye, Basanti, is extracted from the flowers. The bark has astringent properties and is used in medicine.

Leafless Jan., Feb. Fl. Mar. Apr. Fr. June, July.

 C. serrata, Royle; Brandis For. Flora 73, Ind. Trees 145; Gamble Man. Ind. Timb. 160. The Hill Toon. Vern. Darlú, Darli, Darloi, Jaunsar.

A moderate-sized tree; bark with regular longitudinal firsurer from very early age. Leaves usually imparipinate, 2-3 ft. long. Leaflets 12-24 pairs, 3-8 by 1-2·5 in., ovate-lanceolate, accuminate, serrate, glaucous beneath when mature, very unequal-sided at the base; lateral nerves more or less straight; petiolule '1-'2 in. long; rachis and midrib of leaflets red until fully mature; base of petiole much flattened. Flowers pink, often 6-merous, in lax drooping stringy panicle; 3-5 ft. long (one of the largest inflorescences among Dicotyle-Cons); pedicels rusty-tomentose. Calyx cup-shaped; lobes obtuse

Petals about '2 in. long, oblong, glabrous. Disk glabrous. Stamens alternating with sterile filaments. Capsule about 1 in. long by '5 in. diam., ovoid, acute, dark-grey. Seeds winged only at the upper end.

Valleys in JAUNSAR and TEHRI-GARHWAL ascending to about 8,000 ft.: Korwá, Binálgádh below Konáin, Dhárágádh, Tons Valley; Morágádh, etc.

Wood light-red or flesh-colour. It is lighter (about 31 lbs. per c. ft.), coarser and more open-grained than that of Toon, from which it is further recognized by its fetid smell. It is used for bridges, for hoops of sieves, for sleepers of sledge-roads, for jhe mpánpoles and such other purposes. The leaves and young shoots are fopped for cattle-fodder.

Leafless Feb., Mar. Fl. May, June. Fr. July, Aug.

Order 2.—OLACALES.

FAM. 23. OLACACEÆ: G. P. N. 45.

Trees or shrubs, sometimes climbing, often parasitic upon the roots of other plants. Leaves usually alternate, simple, exstipulate. Flowers regular, small, 4-5-merous, 1- or 2-sexual, in cymes or racemes, rarely solitary. Calyx small, sometimes accrescent; lobes 0 or tooth-like and small, valvate or imbricate. Petals free or more or less coherent, usually valvate. Stamens 3-15, free or more or less monadelphous, all fertile or some reduced to staminodes; anthers 2-celled, splitting longitudinally. Disk usually hypogynous, cup-shaped. Ovary always 1-celled above, imperfectly 3-5-celled below, ovules pendulous from the apex of the central placenta; funicle dilated. Style simple or 0. Fruit drupaceous, 1-celled, 1-seeded; seed pendulous, albuminous.

1. Olax, Linn.; G. P. n. 5.

1. **O. nana**, Wall.; Fl. Br. Ind. i. 576; Brandis For. Flora 75, Ind. Trees 148; Gamble Man. Ind. Timb. 163.

An undershrub with a woody rootstock from which annual shoots about 2 ft. high spring up during the rains; stems ribbed. Leaves alternate, 1'5-2'5 by '3-6 in, oblong-lanceolate, subsessile, glabrous and light-green above, glaucous beneath; margins recurved; midrib prominent beneath, straight; lateral nerves indistinct. Flowers solitary, '4 in. across; buds ovoid. Calyxminute, accrescent. Petals 3, oblong-lanceolate. Fertile stamens 3, opposite to the petals staminodes 5-6, bifd, longer than the fertile stamens. Ovary 1-celled; style simple, terminal. Fruit the size of a pea, globular.

On crests of the Saháranpur Siwaliks behind Ránipur; rather scarce.

Fl. Apr., May.

FAM. 24. AQUIFOLIACEÆ (ILICINEÆ); G. P. N. 46.

Trees or shrubs, generally evergreen. Leaves alternate, simple, glabrous, usually coriaceous. Flowers small, unisexual and often diœcious, in axillary fascicles or congested cymes. Calyx 3-6-eleft, persistent, imbricate in bud. Petals 4-5, white, imbricate, deciduous. Stamens 4-5, hypogynous, free or adnate to the petals. Disk 0. Ovary 3-16-celled; style short. Fruit a drupe with 2 or more 1-seeded stones. Seeds with a membranous testa.

1. Ilex, Linn.; G. P. n. 1.

Leaves coriaceous, serrate; midrib depressed above, prominent beneath. Flowers 4-5-merous. Calyx small. Corolla rotate; petals free or connate at the base. Stamens adhering to the base of the corolla. Ovary 2-12-celled; style very short or wanting. Drupe globose or ovoid, with 2-12 stones.

Analysis of the Species.

Leaves coriaceous, serrate.

Petiole not exceeding '3 in.; drupe with

2 stones

Petiole up to '7 in.; drupe with 4 stones

Leaves membranous, entire.

(Petiole '5-1 in. long; drupe with 5

stones)

3. Lexcelsa.

1. I. dipyrena, Wall.; Fl. Br. Ind. i. 599; Brandis For-Flora 76, Ind. Trees 154; Gamble Man. Ind. Timb. 168. The Himalayan Holly. Vern. Kanderú, Jaunsar.

A small evergreen tree with rough dark-grey bark. Leaves 3-5 by 1-1.7 in., elliptic, ovate on ovate-lanceolate, acute or acuminate, spinous-serrate on young plants, nearly entire on old trees, very coriaceous when fully grown; lateral nerves indistinct; petiole 2-3 in. long, channelled. Flowers 25 in. diam., whitish-green, tetramerous, in round axillary clusters, 2-bracteolate. Calyx-lobes broad-ovate, ciliate. Petals obovate, connate below in the male, free in the female flowers. Ovary small; stigma sessile. Drupe 3-5 in. diam., globose or ellipsoid, red when ripe; stones usually 2, longitudinally grooved.

JAUNSAR and TEHRI-GARHWAL, 5-9,000 ft. Common about Chakrata and Deoban and elsewhere on limestone soils.

Wood white, hard and close-grained, but cracks in drying and is chiefly used for fuel.

Fl. Apr.-June. Fr. Aug.-Oct.

2. I. odorata, Ham.; Fl. Br. Ind. i. 599; Brandis For. Flora 77, Ind. Trees 155; Gamble Man. Ind. Timb. 168.

An evergreen tree; branches rather slender. Leaves 4.7 by 1.5.2.5 in., oblong oblong-lanceolate or oblanceolate, acute or acuminate, very regularly and minutely serrate, thinly coriaceous; lateral nerves somewhat more distinct than in the last species; petiole 3..7 in. long, channelled. Flowers small, white, 4-merous, bracteolate, in short axillary panicles. Petals of male flowers connate below, of female flowers free. Stamens much longer than the petals. Ovary globose, 4-celled; stigma sessile. Drupe 2 in. diam., globose, black; stones 4, trigonous.

OUTER HIMALAYA, e. g., be'ow Mussoorie and the Málköt hills; also in the Valley of the Tons in Jaunsar and Tehei-Garhwal, 3,000-4,500 ft. Bháshla Block, Khunigádh, etc.

Fl. Apr. Fr. June.

3. I. excelsa (exsulca), Wall.; Fl. Br. Ind. i. 603; Brandis For. Flora 76, Ind. Trees 156; Gamble Man. Ind. Timb. 167. Vern. Tümari. U. P.

A middle-sized grace ul evergreen tree; bark mcderately smooth, silvery white outside, yellowish and soft inside, with long horizontal wrinkles; young shoots pubescent. Leaves 2-4 by 1·25-2 in., elliptic oblong or ovate, finely acuminate, entire, rather membranous, glabrous and dark-green above, finely grey-pubescent beneath when young, afterwards quite glabrous; lateral nerves about 8 pairs, arcuate; base acute; petiole 5-1 in. long, channelled; stipules minute, caducous. Flowers 2-sexual, about 15 in. across, greenish-white, usually 5-merous, in 8-12-flowered axillary pubescent umbels; peduncles 3-7 in. long, compressed; pedicels about 1 in. long. Calyx-lobes ovate, ciliate. Petals ovate-orbicular, recurved, united at the base. Stamens dilated at the base, as long as the petals, inserted on and alternating with them; anther-lobes ovate. Stigma sessile. Drupe globose, about 2 in. diam., with 5 3-sided stones.

JAUNSAR and TEHRI-GARHWAL, 4,-6,000 ft.: Kiárigádh below Kathián, Mautárgádh, Lúnágádh, etc. Rather scarce,

Fl. May, June. Fr. Oct., Nov.

Order 3.—CELASTRALES.

FAM. 25. CELASTRACEÆ; G. P. N. 47.

Trees or shrubs, the latter erect or scandent. Leaves opposite or alternate, simple, usually coriaceous; stipules minute and caducous, or 0. Flowers 2-sexual or polygamous, generally cymose. Calyx small, 4-5-lobed, imbricate, persistent. Disk conspicuous, sometimes lobed. Petals 0 or 4-5, imbricate, inserted on the disk. Stamens 3-5, inserted on the disk, alternating with the petals or, when the petals are absent, opposite to the calyx-lobes. Ovary 3-5-celled, surrounded by the disk; ovules erect, usually 2 in each cell; style none or short. Fruit various. Seeds mostly arillate, sometimes winged.

Analysis of the Genera.

Fruit a capsule; seeds arillate.		
Fruit lobed winged or echinate; leaves opposite	1. EUONYMUS.	
Fruit never winged or echinate, rarely lobed; leaves alternate.	2. Celastrus.	
Fruit a drupe; seeds exarillate; (leaves sub-		
opposite)	3. Elæodendron	Ŋ.

1. Euonymus, Linn.; G. P. n. 1.

Trees or shrubs, the latter rarely scandent. Leaves opposite: stipules caducous. Flowers 2-sexual, 4-5merous. Calux flat or recurved. Disk broad, fleshy, 4-5-lobed. Petals often with coloured veins. Stamens inserted on the disk. Ovary sunk in the disk; style short. Fruit a capsule, 3-5-lobed -angled or -winged, rarely echinate; dehiscence loculicidal. Seeds enclosed in a fleshy arillode.

Analysis of the Species.

creet shrubs or trees. Capsules without price	Kies.
Flowers (usually) 5-merous.	
(Leaves coriaceous; capsules not winged)	1. E. tingens.
Flowers 4-merous.	
Leaves membranous.	
Capsules 4-winged	2. E. fimbriatus.
Capsules 4-lobed	5. E. Hamiltonianus.
Leaves coriaceous; (capsules 4 winged).	4. E. pendulus.
Scandent shrub, Capsules covered with	•
prickles: leaves subcoriaceous	3. E. echinatus.

1. E. tingens. Wall.: Fl. Br. Ind. i. 610: Brandis For. Flora 79, Ind. Trees 158; Gamble Man. Ind. Timb. 172. Vern. Bhambeli, Roini, Jaunsar.

An evergreen shrub; bark dark ash-coloured, tubercled or corky, bright-vellow inside. Leaves 1.5-3 by .7-1.3 in., elliptic oblong or ovate-lanceolate, acute or acuminate, closely serrate or crenate, glabrous, rugose and dark-green above, pale beneath; lateral nerves faint; stipules brown, fimbriate; petiole '2-'3 in. long. Cymes dichotomous, axillary or sub-terminal; peduncles '5-2 in. long, compressed. Flowers usually 5-merous, about '5 in. diam. Calyx-lobes irregularly divided or fimbriate. Petals orbicular, dull-white, crenulate, marked with brown or purple veins. Stamens shorter than the petals. Style subulate. Capsule '5 in. long, globose, 3-5-angled, not winged. Seeds enclosed in an orange-coloured arillode.

JAUNSAR and TEHRI-GARHWAL, 6,-10,000 ft. Common at Chakrata, Bodyár, Deoban, Konáin; Deotá, etc.

The wood is fine-grained, compact and hard, but is seldom used except for fuel; weight 47 lbs. per c. ft. The corky outer bark of old stems gives a yellow dye.

Fl. Apr.-June. Fr. Aug., Sept.

2. **E. fimbriatus**, Wall.; Fl. Br. Ind. i. 611. Syn.—E. lacerus, Ham.; Brandis For. Flora 78, Ind. Trees 158; Gamble Man. Ind. Timb. 171. Vern. Lichhoi, Angáo or Angáu, Jaunsar.

A small deciduous tree with smooth grey bark; branchlets reddish-brown, compressed. Leaves 1.5-3 by '8-1.3 in., ovate, acuminate, finely doubly-serrate, membranous, glabrous; lateral nerves 4-6, very slender; margins reddish-brown when young; petiole 2-3 in. long; stipules linear, deciduous. Cymes umbelliform, mostly from the base of current year's shoots; peduncles 1-3 in. long, with 3-7 very slender branches; pedicels capillary. Flowers 15 in. diam., tetramerous. Petals oream-oolour, ovate, entire. Anthers on short filaments. Capsule '3-'5 in. diam., globose; wings usually 4, '3 in. long, tapering. Seeds ovoid, enclosed in a red arillode.

Fairly common in Jaunsar and Tehri-Garhwal, 6,-10,000 ft., generally affecting shady aspects.—Deoban, Konáin, Mundáli, etc.

Wood white, compact, tough, close- and even-grained; weight about 48 lbs. per c. ft. It is carved into spoons. The leaves and branches are lopped for fodder. The seeds are often strung up as beads.

Fl. Apr., May. Fr. Augt. Oct.

According to Rai Bahadur Keshavánand, E. frigidus, Wall.—Fl. Br. Ind. i. 611. Vern. Angáu, Jaunsar,—occurs in moist places in the Deoban Range, JAUNSAR. It very closely resembles E. fimbriatus differing only in having succulent young shoots, longer and narrower leaves with simple serratures, and much smaller flowers on weak succulent peduncles and pedicels.

3 .

3. E. echinatus, Wall.; Fl. Br. Ind i. 611; Brandis For. Flora 80, Ind. Trees 158; Gamble Man. Ind. Timb. 170. Vern. Láduli. Garhwal.

A climbing shrub adhering to rocks and trees by dense tufts of adventitious roots; shoots quadrangular. Leaves variable, '5-3 by '2-1 in., ovate- or oblong-lanceolate, acute, crenate or obtusely serrate, subcoriaceous, glabrous; main lateral nerves 8-10 pairs, prominent beneath, joining into an intramarginal vein; petiole margined, of the largest leaves '3 in. long. Flowers about '2 in. diam., greenish, in short axillary cymes. Capsule '3 in. diam., globose, covered with dark-coloured spines.

Fairly common in Jaunsar and Tehri-Garhwal, 7,-10,000 ft. Deoban, Bhújköti, Mundáli; Deotá, etc.

Fl. Mar., Apr. Fr. Aug., Sept.

4. **E. pendulus,** Wall.; Fl. Br. Ind. i. 612; Brandis For. Flora 79, Ind. Trees 159; Gamble Man. Ind. Timb. 172. Vern. Bhambélá, Jaunsar.

A small evergreen tree or large shrub with a short trunk, numerous spreading branches and pendulous branchlets; bark grey, corky. Leaves 3-5 by 1-1.5 in., oblong-lanceolate, equally acute at both ends, sharply serrate, coriaceous, glabrous, shining above; lateral nerves indistinct; midrib pale, prominent; petiole 3-4 in. long, channelled; stipules minute. Cymes axillary or supra-axillary; peduncles 1-2 in. long, much compressed. Flowers 3-5 in. diam., 4-merous. Calyx-lobes obtuse, fimbriate. Petals about 2 in. long, oblong, whitish, fimbriate. Stamens short; anthers ovate. Style short, filiform. Capsule 5 in. diam., 3-4-lobed and sharply angled, more or less winged; arillode reddish-orange.

Open shady aspects and ravines in Jaunsah and Tehri-Garhwal, ascending to 8,500 ft.—Korwá forest, Tutuá and Bámnái Gádhs, Konáin; Lambátách, etc. Very common about Mussoorie.

Wood close- and even-grained; weight 35-40 lbs. per c. ft. It is, however, rarely used except for fuel.

Fl. Apr., May. Fr. June, July.

5. **E. Hamiltonianus**, Wall.; Fl. Br. Ind. i. 612; Brandis For. Flora 78, Ind. Trees 159; Gamble Man. Ind. Timb. 171. Vern. Dádál, Dháruá. Jaunsar.

A large deciduous shrub with a thick corky ashy-grey bark. Leaves variable, 2-6 by 7 1.7 n., oblong or ovate-lanceolate, acuminate, finely serrate, membranous, glabrous, dull-green, not shining; petiole 3-5 in. long. Cymes dichotomous, axillary or intra-axillary; peduncles about 7-flowered. Flowers about 3 in. diam.,

greenish-white. Petals 2.3 in. long, lanceolate or strap-shaped, margins revolute. Stamens and style '1 in. long. Capsule '2-'4 in. diam., turbinate, deeply 3-4-lobed, yellow when ripe. Seeds enclosed in a scarlet arillode.

TEHRI-GARHWAL, 8,-9,000 ft., generally in shady localities; Kotigádh, Bálchá, etc. Rather scarce in Jaunsan; Agragádh near Deoban; also Bodyár.

Wood white, soft and close-grained, used for carving into ladles. Weight about 40 lbs. per c. ft. The branches are lopped for fodder.

Fl. Mar.-May. Fr. Aug.-Nov.

2. Celastrus, Linn.: G. P. n. 16.

Erect or climbing shrubs. Leaves alternate; stipules minute, deciduous, sometimes 0. Flowers small, 4-5merous, 1-sexual or polygamous. Disk broad. Petals usually spreading. Stamens inserted on the margins of the disk. Ovary 2-4-celled, free or immersed in the disk, with 2 ovules in each cell; style short; stigma simple or 3-lobed. Fruit a globose or obovoid loculicidal capsule, 1-3-celled. Seeds 1-2 in each cell, more or less enveloped in an aril.

Analysis of the Species.

An unarmed climbing shrub. Flowers in large terminal panieles 1. C. paniculata. Armed erect shrubs or trees. Flowers in small axillary cymes. A shrub; leaves ovate or obovate 2. C. Royleana. A tree; leaves lanceolate . .

1. C. paniculata, Willd.; Fl. Br. Ind. i, 617; Brandis For. Flora 82, Ind. Trees 162; Gamble Man. Ind. Timb. 175. Vern. Málkánani, Málkákni, Hind.

A large woody climber with corky bark; young shoots marked with lenticels. Leaves very variable in size and shape, generally 2-4 by 1.5-3 in., obovate orbicular elliptic or oblong-lanceolate, shortacuminate, crenate, more or less coriaceous, glabrous; base a sute; lateral nerves 4-6 pairs, parallel to the margins; petiole '4-'6 inlong. Panicles terminal, large, drooping, pubescent, branching into compound tymes. Flowers '15 in. across, pale-green. Calyx-lobes rounded, toothed. Petals oblong. Anthers large, about the size of the petals. Ovary free; stigma simple. Capsule '4-'5 in. diam., globose, usually 3-celled, bright-yellow when ripe. Seeds 1-2 in each cell, black, enclosed in a red arillus.

Common in the Dun and Sahiranpur Forests, also at low elevations in Jaunsar and the Outer Himalaya. It has a striking appearance when in fruit, which hangs gracefully like bunches of vellow beads.

The leaves and seeds are used in country medicine. An oil is extracted from the seeds which is believed to have great medicinal virtue, and is also used for burning.

Fl. Apr.-June. Fr. Cold season.

2. C. Royleana, Wall.: Syn.—Gymnosporia Royleana, Wall.; Fl. Br. Ind. i. 620; Brandis Ind. Trees 163. Celastrus spinesa, Royle; Brandis For. Flora 80; Gamble Man. Ind. Timb. 176. Vern. Gwála Dárim, Hind.

A thorny shrub 8-10 ft. high; bark thin, grey, corky; spines 5-1 in. long, axillary, straight, slender. Leaves 5-2 by 3-1-2 in., obovate or ovate, serrate crenate or subentire, coriaceous, very slightly pubescent when young, lateral nerves faint; tip acute rounded or emarginate; petiole 1-2 in. long. Cymes axillary, shorter than the leaves; pedicels slender. Calyx-lobes ciliate. Petals 1 in. long, whitish, ovate-oblong. Ovary sunk in the fleshy disk. Capsule 2-3 in. diam., turbinate, 3-cornered; seeds partially covered with a white aril.

Banks of the Jumná near Dákhpathár, also Ámbári, in the Dốn; and Bádsháhibágh and Khárá in the Saháranpur District. It is likely to be mistaken for Flacourtia Ramontchi, which it closely resembles in foliage and general appearance.

Fl. and Fr. almost throughout the year, but more generally in the cold season.

3. **C. rufa**, Wall.; Brandis For. Flora 80; Gamble Man. Ind. Timb. 176. Syn.—Gymnosporia rufa, Wall., Fl. Br. Ind. i. 620.

A tree armed with short axillary spines; very young leaves and inflorescence slightly rusty-pubescent (whence the specific name),

otherwise glabrous. Leaves 2-4 by '7-1'3 in., oblong-lanceolate. acuminate, spinous-serrate, subcoriaceous, pale beneath; midrib stout, prominent beneath; lateral nerves much branched. faint: petiole 2.3 in. long. Cymes axillary, fascicled, 2.5 in. long: branches and pedicels reddish, capillary. Flowers whitish, very small. Petals 1 in. long. Stigma lobed, spreading. Capsule 2-3 in. diam., turbinate, 3-lobed, 3-celled, 3-seeded; seeds black, enclosed in a yellow arillus.

Very scarce. Has been only once found by Mr. J. F. Duthie in the khud below Zabarkhet at MUSSOORIE.

Fl. Mar., Apr. Fr. May, June.

The following species are also likely to occur in the region of this Flora :--

C. acuminata, Hook. f. Syn.—Gymnosporia acuminata, Hook f.; Fl. Br. Ind. i. 619. Leaves 2-3 in. long, narrowly ovate-oblong serrate, acute at both ends, membranous. Capsule about '5 in. diam., 2-celled, 2-seeded.

C. montana, Roxb. Syn.—Gymnosporia montana, Roxb., Fl. Br. Ind. i. 621. Celastrus senegalensis, Lam.; Brandis For. Flora 81. Ind. Trees 163. Leaves subsessile, 1-2 by '3-8 in., oblanceolate or obovate, crenulate, corisceous. Capsules 15 in. diam., 1-3-celled. black.

3., Elæodendron, Jacq. fil.; G. P. n. 28.

L. glaucum, Pers.; Fl. Br. Ind. i. 623; Brandis Ind. Trees 164. Syn. - E. Roxburghii, W. & A.; Brandis For. Flora 82; Gamble Man. Ind. Timb. 178. Vern. Dhebri, Hind.; Jangela, Jangél, E. Dún; Pániála, W. Dún.

A moderate-sized or large tree, often with reddish branchlets: bark dark-grey, smooth, blood-red inside, exuding when cut a profuse waterv sap from the cambium-layer. Leaves opposite or sub-opposite; less frequently alternate, 2.6 by 1.3 in., elliptic ovate oblong or obovate, acuminate, crenate sub-coriaceous, glabrous, dark-green and shining above, glaucous, beneath (whence the specific name); main lateral nerves about 10 pairs, slender; petiole 4.1 in. long, channelled. Cymes axillary, dichotomous, 3.5 in. long; peduncle 1.2.5 in. long, often red. Flowers 2 in. diam., whitish. Calyx 4.5. cleft; segments obtuse. Disk fleshy. Petals 4.5, about 1 in. long, oblong. Stamens 4-5, short, inserted under the edge of the disk; filaments recurved. Ovary adnate to the disk; style very short. Fruit a dry obovoid drupe, '4-'6 in. long, 1-celled, 1-seeded, tipped with the persistent style, mostly sterile (reproduction chiefly by root-suckers).

SIWALIK DIVISION also in valleys in the HILLS, generally affecting a clayey binding soil, and consequently with Sain in Sal forests .- Tháno, Lachiwála, Karwápáni, Timli Pass, Dholkhand, Ránipur, Ká'si. etc.

Wood moderately hard, even- and close-grained, deep-red when fresh-cut, turning light-brown in seasoning; weight 40-50 lbs. per c. ft. It takes a fine polish, and is used for cabinet-work and picture-frames. Forest contractors in the Dun generally convert it into karries, which are exported into the plains districts and sold there as Sal. "The root is believed to be a specific for snake-bites, and the bark is used in native medicine."-Sir D. Brandis.

Leafless in Apr. Fl. Feb.-June. Fr. Jan.-June of the next vear.

FAM. 26. RHAMNACEÆ G. P. N. 49.

Trees or shrubs, often armed. Leaves simple, generally alternate; stipules small, sometimes changed into prickles. Flowers 1-sexual or polygamous, green or yellow, small, usually in axillary cymes. Calyx 4-5cleft, sometimes superior; lobes triangular, valvate in bud. Petals 4-5 or 0, involute, inserted on the throat of the calyx-tube, alternating with and generally shorter than the calvx-segments. Disk various. Stamens 4-5. opposite to the petals and often enclosed within their folds: anthers versatile. Ovary free or more or less immersed in the disk, usually 3-celled, with one erect ovule in each cell.; styles united. Fruit various. generally indehiscent; seeds 1-4.

Analysis of the Genera.

Ovary superior or half-superior.	: ;; t
Scandent shrubs. Fruit terminating in a long wing Generally erect shrubs. Fruit not winged.	1. VENTILAGO.
Disk thick, filling the calyx-tube. Leaves more or less oblique, 3-5-nerved at	
the base.	- '
Armed. Fruit with a 1-4-celled stone; pedunole not thickened Unarmed. Fruit 3-seeded; pedunole	2. Zizyphus,
thickened in fruit Leaves symmetrical, penninerved.	5. HOVENIA.
Leaves alternate; drupe 2, celled, 2-seeded Leaves opposite or sub-opposite; fruit	3. Berchemia.
3-celled, 3-seeded	6. SAGERETIA.
(Leaves symmetrical, alternate; fruit 2-4- seeded)	4 D
Ovary inferior. Cirrhose climbing shrubs.	4. RHAMNUS.
Flowers racemed; fruit winged Flowers umbelled; fruit not winged	7. GOUANIA. 8. HELINUS.

1. Ventilago, Gærtn.; G. P. n. 1.

1. **V. calyculata**, Tulasne; Fl. Br. Ind. i. 631; Brandis For. Flora 96, Ind. Trees 168; Gamble Man. Ind. Timb. 180. Vern. *Káli-bel*, Dún.

A large woody climber generally with strong tendrils; branchlets pubescent; bark dark-grey. Leaves 2-4 by 1-2.5 in., ovate- or oblong-elliptic, more or less acute, crenate or entire, subcoriaceous, pubescent when young; lateral nerves 6-8 pairs, arcuate; base unequal; petiole 2-4 in., pubescent. Flowers numerous, small, greenish, in large terminal panicles. Calyx pubescent; lobes 5, keeled inside. Petals 5, deflexed. Disk 5-lobed, filling the calyx-tube. Ovary 2-celled, sunk in the disk; style short, prolonged and winged on both sides in fruit. Fruit a sub-globose nut, about 2 in. diam., girt about the middle by the rim of the adherent calyx-tube and prolonged into a wing which is 1-1.5 by 3-4 in., linear, strongly reticulate and with a prominent straight midrib.

Shady mixed forests and ravines in Sanánanpus and the Dún;

— Kasúmri, Chilláwála; Tháno, Káluwála, Nakraunda, Lachiwála, Dúdhli, Ráiwála, Khairi, etc.

Wood pale-yellow, tough, capable of being used for fuel.

Fl. Feb., Mar. Fr. May, June.

2. Zizyphus, Juss.; G. P. n. 4.

Trees or shrubs, sometimes sarmentose, usually armed with stipulary prickles. Leaves alternate, more or less distichous, subcoriaceous, 3-5-nerved at the base. Flowers small, in axillary fascicles or cymes. Calyx 5-fid; lobes keeled within. Petals 5 or 0, deflexed. Disk 5-10-lobed, coating the calyx-tube; edges free. Stamens 5. Ovary immersed in the disk and adnate to it at the base, 2-4-celled; styles 2-4, free or partly connate. Fruit a fleshy or dry drupe with a hard 1-4-celled and 1-4-seeded stone.

Analysis of the Species.

Flowers fascicled or in sessile cymes. Leaves broad-ovate or suborbicular, glabrous above, felted beneath; drupe over 5 in. long. Leaves ovate-lanceolate, acuminate; drupe about 3 in. diam.	1. Z.	Jujuba.
An erect shrub. Leaves wholly glabrous; prickles usually in pairs A straggling shrub. Leaves hairy on both surfaces; prickles solitary		
Flowers in peduncled cymes; leaves generally obtuse, glabrous above. Cymes short, simple; drupe 1 in. diam., dry, tomentose, 3-celled Cymes long, panicled; drupe 3 in. diam., fleshy, glabrous, 1-celled		xylopyra. rugosa.

1. Z. Jujuba, Lam.; Fl. Br. Ind. i. 632; Brandis For. Flora 86, Ind. Trees 170; Gamble Man. Ind. Timb. 181. Vern. Ber, Beri, Hind. The cultivated variety is called Pewandi or Pemdi Ber, and the degraded form Jhár Beri, Hind.

A moderate-sized tree, almost evergreen; bark dark-grey or nearly black, with long deep vertical eracks, reddish and fibrous inside; young parts rusty-tomentose. Leaves very variable, 1-4 by '6-3 in., suborbicular, elliptic or ovate, closely serrulate or entire, rounded at both ends, dark-green glabrous and often shining above, densely woolly-tomentose beneath; base more or less oblique, strongly 3-nerved, nerves closely penniveined; petiole '1-'6 in. long; prickles solitary or in twos. Flowers greenish-yellow, in short axillary oymes or fasoioles, scarcely exceeding the petioles. Calyx glabrous within. Petals concave, reflexed. Disk 10-lobed. Oxary 2-oelled; styles 2. Drupe 2-oelled, very variable in size and shape, '5-1'5 in. long, globose to ellipsoidal or obovoid-acuminate, red or orange when ripe.

Extremely common and gregarious along the foot of the Samia-RANPUR SIWALIKS, especially at Beribara. Represented in the Dun by what appears to be a degraded form, which is common as a bush in grass-lands. The Pewandi Ber is cultivated in gardens, especially in Samaranpur.

Wood hard, compact, tough, reddish; annual rings not distinct; weight 43-52 lbs. per c. ft. It is used for agricultural implements, and is very good for fuel and charcoal. The fruit is eaten. Lac is produced on its branches. The branches and leaves are lopped for fodder.

Fl. Sept.-Nov. Fr. Dec.-Feb.

2. **Z. oxyphylla**, Edgew.; Fl. Br. Ind. i. 634; Brandis For. Flora 85, Ind. Trees 171; Gamble Man. Ind. Timb. 183. Vern. Beri, Jaunsar.

A thorny shrub, usually with a few scattered hairs on young parts, otherwise quite glabrous; bark thin, brown. Leaves 1-2 by 7-1-13 in., ovate-lanceolate, gradually acuminate, mucronate, finely serrate, rather membranous, glabrous; base subcordate, oblique, 3-nerved; petiole 2-4 in. long, slender; prickles weak, usually in twos, one of which points upward. Flowers pale, in axillary fascicles, about 15 in. diam.; pedicels slender, 2-3 in. long. Calyx-lobes triangular, acute. Petals clawed. Disk thin, 5-lobed. Ovary 2-celled; styles 2, united to beyond the middle. Drupe about 3 in. long, ovoid, fleshy, 2-celled and 2-seeded, less frequently 1-celled and 1-seeded, orange-red when ripe but drying black; seeds brown plano-convex.

Up to 6,000 ft. in JAUNSAR and TEHRI-GABHWAL, generally round villages and in open valleys: Binálgádh, Dhármigádh, Siligádh, etc.

Wood white, moderately hard. It is often planted in hedges and also for its acid fruit which tastes like tamarind.

Fl. May, June. Fr. Oct., Nov.

3. Z. Œnoplia, Mill.; Fl. Br. Ind. i. 634; Brandis For. Flora 86, Ind. Trees 170; Gamble Man. Ind. Timb. 183. Vern. Makōh, Saháranpur.

A thorny shrub with long sarmentose branches; bark rough, dark-grey. Leaves 1.2 by '7.1 in., very obliquely ovate-lanceolate, mucronate, obscurely crenate-serrate or subentire, more or less pubescent above, softly rusty-tomentose beneath; base 3.4-nerved; petiole '1.'3 in. long, pubescent, rather stout; prickles small, recurved, generally solitary. Cymes dichotomous, compressed. Calyx tomentose outside. Petals obtriangular. Ovary 2-celled: styles 2, united to above the middle. Drupe about '25 in. diam., sub-globose or ovoid, black when fully ripe, with a scanty mealy acid pulp, 2-celled, 2-seeded, but generally 1-celled and 1-seeded by abortion.

Common along the foot of the Sahábanpur Siwaliks. Somewhat rare in the Dún being found only about Pardúni.

The long branches are much in demand for fencing round fields, and the plant is often grown in hedges. The fruit is eaten.

Fl. Apr., May. Fr. Cold season.

4. **Z. kylopyra**, Willd.; Fl. Br. Ind. i. 634; Brandis For. Flora 90, Ind. Trees 171; Gamble Man. Ind. Timb. 183. Vern. Bhander, Kath Ber, Dún and Saháranpur.

A large erect shrub; branches more or less straggling; young shoots rusty-tomentose; bark thin, brownish-grey, smooth or rough with small exfoliating scales. Leaves 1-3.5 by '7-2.5 in., orbicular, broadly elliptic or obovate, serrulate, obliquely sub-cordate or rounded at the base, tip rounded or acute, slightly pubescent along the nerves, otherwise glabrous above, brown-pubescent beneath; petiole '1-'3 in., tomentose; prickles usually in twos, one straight, the other recurved, often wanting. Cymes axillary, peduncled. Flowers scarcely '1 in. diam. Calyx-lobes keeled only at the apex. Petals reflexed. Disk thin, 5-angled. Ovary usually 3-celled; styles 3, almost free. Drupe about 1 in. diam., globose, often depressed at the ends, more or less white-tomentose, 3-celled, dry, not edible.

Common in the Dún and Samanapur Districts, generally in scrub forests, but is sometimes also found with Sál.

Wood yellowish-brown, hard and durable, also easy to work, but is seldom used except for fuel; weight about 50 lbs. per c. ft. The bark is used for tanning, and the leaves for fodder. The fruit is used to give a black dye to leather.

Leafless Mar., Apr. Fl. Apr., May. Fr. Cold season.

5. **Z. rugosa**, Lam.; Fl. Br. Ind. i. 636; Brandis For. Flora 89, Ind. Trees 171; Gamble Man. Ind. Timb. 184. Vern. Bhand Ber. Dún.

A small evergreen tree; branches few, somewhat straggling; young parts generally rusty-tomentose, bark dark-grey or nearly black, deeply cracked into thick rectangular scales. Leaves 2.4 by 1.7.3.5 in., sub-orbicular ovate or elliptic, closely serrulate, sub-acute, obliquely rounded or sub-cordate at the base, dark-green and glabrous above, thickly grey- or rusty-felted beneath; basal nerves 3, each closely penniveined; petiole '2-'3 in. long, stout; prickles few, usually solitary, recurved. Cymes arranged in long axillary or terminal panicles which are often 1 ft. long, rusty-tomentose throughout. Calyx-lobes not keeled. Petals 0. Disk 5-angled, hairy. Ovary 2-celled; styles 2, united bolow the middle. Drupe about '3 in. long, globose or pyriform, 1-celled, 1-seeded.

Along the foot of the Nágsidh Hill and at Rámgarh in the Dốn, also in valleys in the Hills up to $3,000~\rm{ft.}$; not very common.

Wood reddish, moderately hard, but warps and is liable to be attacked by insects. It is used chiefly for fuel. The fruit is eaten and the leaves are lopped for fodder.

Fl. Mar., Apr. Fr. Rainy season.

3. Berchemia, Neck.; G. P. n. 8.

Unarmed erect or climbing shrubs. Leaves alternate, closely penninerved. Flowers usually 5-merous and 2-sexual. Calyx persistent. Petals usually obovate or oblanceolate. Disk lining the calyx-tube. Ovary 2-celled, sunk in the calyx-tube, but not adnate to it. Fruit a drupe or a berry, usually tipped with the remains of the style; kernel 2-celled, 2-seeded.

Analysis of the Species.

A climbing shrub. Leaves 2-4 in. long . 1. B. fl ribundo: An erect undershrub. Leaves about 5 in. long . 2. B. lineals.

- 1. B. floribunda, Brongn.; Fl. Br. Ind. i. 637; Brandis For Flora 91, Ind. Trees 169; Gamble Man. Ind. Timb. 184. Vern. Kouloi or Káuloi, Jaunsar; Amili, Garhwal.
- A large climbing shrub; bark thin, whitish outside, inner layer purple. Leaves 2-4 by 1-2 in., ovate or oblong, acuminate, thinly sub-coriaceous, glabrous, rounded or sub-cordate at the base; lateral nerves 10-12 pairs, straight, parallel, slender but distinct; petiole '5-'7 in. long, terete; stipules 2-fid. Flowers minute, ''3-10 in cymose clusters, arranged in racemes 2-3 in. long, which again form large terminal panicles.''—Sir D. Brandis. Fruit'3-'5 in. long, ovate-oblong or cylindrical, fleshy.

Swampy localities in the Dfn, e.g., Káluwála, Nakraunda Jogiwála, etc., and in shady ravines up to 4,500 ft. in the Hills, e.g., Binálgádh, Chátrágádh, etc.

Fl. May-July. Fr. Feb.-Apr.

2. B. lineata, DC.; Fl. Br. Ind. i. 638; Brandis Ford Flora 91, Ind. Trees 169; Gamble Man. Ind. Timb. 184. Vern. Angári, Jaunsar.

An undershrub 3-5 ft. high, with smooth shining bark; young shoots puberulous. Leaves variable, generally about '5 in. long, oblong or ovate, elegantly marked underneath with 6-8 pairs of fine straight nerves; potiole '1-'2 in. long, slender; stipules bristle-like. Flowers minute, in axillary or terminal clusters. Calyx-lobes linear. Petals linear-lanceofate. Berry '25-'4 in. long, cylindrical, blue when ripe.

JAUNSAR and TEHRI-GARHWAL, 8-9,000 ft.; not very common. Bájámára; below "Snow View" and at Kanjátra, Deoban, etc.

- Fl. May-July. Fr. Sept.
- B. Edgeworthii, Lawson; Fl. Br. Ind. i. 638; Brandis Ind. Trees 169; a shrub closely resembling the above, but with glabrous branches, 6-merous flowers, and somewhat larger leaves and fruit, has also been found in Jaunsar and Temri-Garriwal, e. g., Durani Dhár, Oshlá, Kanjátra, etc.—Mr. J. S. Gamble.

4. Rhamnus, Linn.; G. P. n. 10.

Shrubs or trees, sometimes with spinescent branchlets. Leaves alternate or fascicled (by the arrest of the growth of the branchlets), penninerved. Flowers unis xual or polygamous, in axillary fascicles or cymes. Calyx 4-5-fid; lobes keeled within. Disk thin, lining the calyx-tube. Petals 4-5 or 0. Stamens 4-5, inserted with the petals on the edge of the disk; filaments short. Ovary free, 3-4-celled, narrowed into a 3-4-celled style; stigma papillose. Fruit a berry-like drupe, 2-4-celled, 2-4-seeded, seated on the persistent calyx-tube.

Analysis of the Species.

Erect shrubs or trees. Spinescent shrubs. Leaves mostly fascicled: flowers 4-merous. Leaves sub-coriaceous, alternate on growing shoots: stem ash-coloured 1. R. persicus. Leaves membranous, sub-opposite on growing shoots; stem shining dark-grey. 2. R. dahuricus. Unarmed. shrubs. Leaves not fascicled: flowers 5-merous. Leaves membranous; branchlets purple; cymes sessile . 3. R. purpureus. Leaves sub-coriaceous; branchlets green; cymes racemed . 4. R. triqueter. A prostrate shrub, not armed. (Leaves coriaceous: flowers 5-merous) . . 5. R. procumbens.

1. **R. persicus**, Boiss.; Fl. Br. Ind. i. 638; Brandis For. Flora 93; Gamble Man. Ind. Timb. 185. Vern. Chirla, Dan.

A deciduous shrub with a short erect trunk and stiff branches, often armed; bark smooth, ash-coloured; epidermis peeling off generally in vertical strips. Leaves alternate on growing shoots, fascicled on arrested branchlets, '5-2 in. long, ovate elliptic lance-olate or obovate, acute acuminate or rounded at the tip, minutely serrulate or entire, sub-coriaceous, slightly tomentose beneath; petiole minute to '3 in. long. Flowers 4-merous, short-pedicelled, dioccious, in axillary fascicles. Petals small, linear. Fruit about '2 in. diam., obovoid or turbinate.

In the Dún at Mothron wala, and near the Harbans wala Chauki; also in Jaunsar up to 6,000 ft., e. g., Saiá, the slopes below Konain village, etc.

The fruit is eaten, and the leaves are browsed by goats.

Fl. Mar.-May, before the new leaves, but generally throughout the year. Fr. Chiefly Nov., Dec.

virgatas, Roxb.; Brandis For. Flora 92, Ind. Trees 172; Gamble Man. Ind. Timb. 185. The Himalayan Buckthorn. Vern. Thanthár, Jaunsar; Chaurdhá, Garhwal.

A deciduous shrub or small tree, generally with a stout spine at the forks of the branches; bark dark-grey, thin, smooth, shining, peeling off in horizontal rolls. Leaves generally sub-opposite on growing shoots, fascicled on arrested branchlets, '5-2 by '2-1 in., rhomboidal ovate or ovate-lanceolate, acuminate, minutely serrulate or entire, membranous, slightly pubescent beneath when young; lateral nerves 3-5 pairs, slender; base acute; petiole '1-'4 in. long. Flowers 4-merous, in dense axillary fascicles; buds pointed; pedicels long or short, filiform. Calyx-tube campanulate. Petals minute. Fruit about '15-'25 in. diam., globose.

Common in JAUNSAR and TEHRI-GARHWAL between 3,000 and 9,000 ft., also along the Bindál nálá, DEHRA DÚN.

The wood is hard and close-grained; weight 56 lbs. per c. ft. Capable of being used for agricultural implements. "The fruit is bitter, emetic and purgative, and is given in affections of the spleen."—Mr. J. S. Gamble.

Fl. Apr.-June. Fr. Cold season. Often fl. and fr. throughout the year.

3. R. purpureus, Edgew.; Fl. Br. Ind. i. 639; Brandis For. Flora 91, Ind. Trees 173; Gamble Man. Ind. Timb. 186. Vern. Luhish, Lhish, Jaunsar.

An unarmod deciduous shrub; bark thin, smooth. Leaves alternate, 2.4 by 1.2 in., elliptic or ovate-lanceolate, acuminate, serrate or crenate, membranous, pubescent beneath when young; lateral nerves 6-10 pairs, somewhat arcuate, prominent. Flowers 2-sexual, 5-merous, in short axillary cymes; buds ovoid. Calyx cupshaped; segments acute. Petals usually 0. Style short, 3-cleft, Drupe about 2-3 in. diam., sub-globose or pyriform.

Jaunsar and Tehri-Garhwai, between 4,500 and 9,500 ft. Common at Deoban, Mundáli; Deotá, etc., generally on open shady aspects.

Wood brownish-grey, close-grained; weight 41 lbs. per c. ft. Ihe fruit is used as a purgative.

Fl. May, June. Fr. July-Oct.

4. R. triqueter, Wall.; Fl. Br. Ind. i. 639; Brandis For. Flora 92, Ind. Trees 173; Gamble Man. Ind. Timb. 186. Vern. Katherú, Jaunsar; Gaunt, Dún and Garhwal.

An unarmed deciduous shrub; bark dark-grey, thin. Leaves 2-6 by 1-2 in., ovate-oblong, acuminate, closely serrate, glabrescent above, finely pubescent beneath, somewhat brittle, drying yellowish-green, often mixed with smaller leaves which are 5-1 in. long; lateral nerves 8-10 pairs, arcuate; base rounded or acute; petiole 3-1 in. long. Racemes of cymes 2-4 in. long, axillary, sometimes with a few leaf-like small bracts. Flowers puberulous. Calyx-lobes acute. Petals clawed, emarginate, sheathing the stamens. Drupe 3-lobed.

OUTER HIMALAYA and JAUNSAR, 3,-6.000 ft. Common below Mussoorie and also about Tiuni in the Tons Valley. Málköt Hills down to Tháno in the Dún; also near Ambári. Also found in the Siwaliks, e.g., in the Timli Pass.

Wood yellowish-brown, hard and close-grained, capable of being used for agricultural implements.

Fl. July, Aug. Fr. Oct.-Dec.

5. **R. procumbens**, Edgew.; Fl. Br. Ind. i. 640; Brandis For. Flora 93, Ind. Trees 173; Gamble Man Ind. Timb. 187.

A small procumbent shrub, usually trailing on rocks; young branches pubescent. Leaves '3-1 in., elliptic or lanceolate, acute or acuminate, serrulate, coriaceous, dark-green; midrib prominent beneath, depressed above; lateral nerves faint; petiole of the largest leaf about '1 in. long; stipules setaceous, persistent. Flowers axillary, often solitary, on slender pedicels which are '2-'5 in. long. Fruit about '15 in. diam., globose, fleshy.

Jaunsab, 7,000 to 8,500 ft. Common on rocks at Matkángrá and in the Mohná Block, Deoban; Tutuá Block, Mundáli, etc.

Wood yellowish, hard, close-grained and tough.

Fl. July, Aug. Fr. May, June (next year?).

5. Hovenia, Thunb.; G. P. n. 12.

1. **H. dulcis**, Thunb.; Fl. Br. Ind. i. 640; Brandis For. Flora 94, Ind. Trees 174; Gamble Man. Ind. Timb. 187.

A small deciduous tree with a straight trunk. Leaves alternate. 4-6 by 2-3.5 in., ovate, long-acuminate, often inequilateral, serrate, membranous, glabrescent above, more or less tomentose beneath, 3-nerved at the base; lateral nerves 3-5 pairs above the

basal; petiole '5-'7 in. long. Flowers 2-sexual, white, in axillary and terminal dichotomous cymes; peduncle 1-2 in. long. Calyx 5-fid; tube conical, deciduous. Petals 5, clawed. Disk fleshy, woolly. Stamens 5, longer than the petals, inserted on the edge of 'the disk. Ovary 3-celled, sunk in the disk; styles 3. Fruit a 3-celled 3-seeded indehiscent drupe, about '3 in. diam.; the peduncle and part of the inflorescence thicken into a fleshy mass when the fruit ripens.

JAUNSAR and TEHRI-GARHWAL, 3,000 to 6,500 ft.: Thadiár, Bámsu, Dárnagádh, etc.

The fleshy peduncle is sweet and aromatic, and is eaten. The leaves are eaten by cattle.

Fl. Apr.-June. Fr. July-Sept.

6. Sageretia, Brongn.; G. P. n. 15.

1. S. oppositifolia, Brongn.; Fl. Br. Ind. i. 641; Brandis For. Flora 95, Ind. Trees 173; Gamble Man. Ind. Timb. 188. Vern. Gonta. E. Dún.

A shrub or small tree with long subscandent spinous branches; branchlets tomentose when young. Leaves usually opposite, 2-4 by 1-1 5 in., those towards the end of the branches usually much smaller, ovate-lanceolate, acute or acuminate, scrrate or sub-entire, sub-coriaceous, glabrescent above, pubescent (at least along the nerves beneath; lateral nerves 5-8 pairs, impressed above, prominent beneath; base rounded, rarely subcordate; petiole 5 in. Flowers very small, in large terminal panioles with opposite racemose ramifications, often mixed with small membranous leaves. Calyx flat, 5-toothed. Petals 5, clawed, hooded. Disk cup-shaped, lining the calyx-tube. Stamens 5, as long as the petals. Ovary 3-celled, narrowed into three coherent styles. Fruit berry-like, turbinate, 2-3 in. diam., black when ripe.

Throughout the OUTER HIMALAYA, 3,-6,000 ft.: Málköt, Jákhan Canal, below Mussoorie, Sahanara-dhárá, Saiá, Korwá, etc.

The wood is tough and is sometimes used for axe-handles. The fruit is edible.

Fl. July-Sept. Fr. Apr.-June.

7. Gouania, Linn.; G. P. n. 35.

1. G. leptostachya, DC.; Fl. Br. Ind. i. 643; Brandis For. Flora 574, Ind. Trees 175; Gamble Man. Ind. Timb, 189.

An unarmed climbing shrub bearing tendrils at the ends of the branchlets. Leaves alternate, 2-4 by 1.5-2.5 in., ovate, acumin-

ate, crenate, sub-coriaceous, more or less rusty-pubescent beneath when young; lateral nerves 5-6 pairs, often opposite, arcuate, the lowest pair from near the base; base rounded or sub-cordate; petiole -3-6 in. long. Flowers white, about -15 in. diam., in axillary or terminal often leaf-bearing racemes which are 6-10 in. long and generally simple. Calyx superior, 5-fid. Disk filling the calyx-tube, 5-lobed. Petals 5, inserted below the margin of the disk. Stamens 5, enfolded by the petals. Ovary 3-celled, sunk in the disk. Fruit 5 in. long, 3-winged, 3-celled, 3-seeded, crowned by the remains of the calyx.

Common almost throughout the Dún.: Barotiwála, Ambári, Robbers' Cave, Bindál nálá, Lachiwála, Káluwála, Tháne, Khairi, etc., spreading on trees, with a graceful appearance when in flower.

Fl. Aug., Sept. Fr. Nov., Dec.

8. Helinus, E. Meyer; G. P. n. 36.

1. **H. lanceolatus**, Brandis For. Flora 574; Gamble Man. Ind. Timb. 189; Fl. Br. Ind. i. 644.

An unarmed twining shrub; branches slender, branchlets angular, usually with a tendril near the end. Leaves 1-3 by '5-1 in., lanceolate, very gradually acute, rather membranous, wholly glabrous or slightly canescent beneath; lateral nerves 3-4 pairs, slender; base rounded or sub-cordate, 3-nerved. Flowers about '2 in. diam., pale-yellow, umbelled on short lateral branchlets, each umbel subtended by a bract or rudimentary leaf '3-'7 in. long; peduncles '51 in. long, slender. Calyx superior, cup-shaped. Disk filling the calyx-tube. Petale 5, hooded, inserted on the margin of the disk. Stamens 5, equalling the petals. Ovary 3-celled; stigmas recurved. Fruit '2-'3 in. diam., broadly turbinate or globose, 3-celled, 3-seeded, tardily dehiscent.

Ravines, banks of streams and shady places in the Dún, and n the Saháranpur Siwaliks, also occasionally in valleys in Jaunsar: Tapkeshwar, Lachiwáh; Sháhjahánpur, Ránipur, etc.,

Fl. and fr. almost throughout the year.

FAM. 27. VITACEÆ (AMPELIDEÆ); G. F. N. 50.

Erect or climbing shrubs usually with copious waterv juice. Leaves alternate, stipulate, simple or compound.

Flowers regular, cymose, usually 2-sexual. Calyx entire, or 4-5-toothed or -lobed. Petals 4-5, free or cohering at the base or apex, valvate, caducous. Disk fleshy. Stamens as many as the petals and opposite to them; filaments subulate, sometimes monadelphous. Ovary 2-6-celled; style short or none. Fruit a berry with 1-6 bony seeds.

Analysis of the Genera.

Climbing shrubs. Stamens free; ovary 2-celled.

1. VITIS.

Erect shrubs or herbs: Stamens monadelphous; ovary 3-6-celled .

. 2. LEEA.

1. Vitis, Linn.; G. P. n. 1.

Climbing shrubs, sinistrorse if twining, usually with leaf-opposed tendrils. Leaves simple or 3-9-foliolate. Flowers variously cymose, 2-sexual or polygamous. Calyx 4-5-lobed. Petals 4-5, free or cohering at the apex. Stamens free, inserted below the margins of the disk. Ovary usually 2-celled, with 2 ovules in each cell; style short or 0. Fruit a 1-4-seeded berry.

Analysis of the Species.

Leaves simple.		
Flowers tetramerous	1.	V. repanda.
Flowers pentamerous.		-
Branches and under surface of leaves		
densely tomentose	2.	V. rugosa.
Branches and leaves glabrous, or the		-
latter slightly pubescent.		
Stem soft. Leaves broader than long	3.	V. latifolia.
Stem woody. Leaves longer than		•
broad	4.	V. parvifolia.
Leaves 3-foliolate; flowers pentamerous .	5.	V. semicordata.
Leaves pedately 5-foliolate; flowers tetra-		
merous	6.	V. capriolata.

1. **V. repanda**, W. & A.; Fl. Br. Ind. i. 648. Gamble and Ind. Timb. 190.

A large climber; branches ribbed, brittle, woolly when young; old stem with wrinkled bark. Leaves simple, 3-5 by 2.5-4 in., ovate, cordate, acuminate, crenate with sharp points, rusty-tomentose beneath when young, glabrescent when old; petiole 1-3 in. long; tendril forked. Flowers in slender umbel-bearing oymes; peduncle 1-4 in. long. Petals cream-coloured, connate at the apex. Fruit -3-4 in. long, pyriform, tipped with the persistent style.

The Dun, and at low elevations in Jaunsan and TEHRI-

GABHWAL; not common. Phándowála.

Fl. May, June. Fr. Rainy season.

2. **V. rugosa**, Wall.; Sir G. King in Journ. As. Soc. Beng. lxv, Part ii, No. 2, p. 111. Syn.—*V. lanata*, Roxb.; Fl. Br. Ind. i. 651; Brandis For. Flora 99, Ind. Trees 177; Vern. *Bhinána*, Jaunsar.

A large woody climber; branches inflorescence and leaves covered with reddish or brown-felted tomentum. Leaves simple, 3-4 in. diam., ovate or suborbicular, cordate, acuminate, dentate, more densely tomentose beneath than above, sometimes obscurely 3-lobed. 3-7-nerved at the base; petiole 1-2.5 in. long; tendrils simple or forked. Flowers greenish, very sweet-scented, in large leaf-opposed compound panieles; pedunole 1-3 in. long, generally with a tendril at the apex. Petals pale-green, connate above. Stamens long; filaments very slender. Fruit about '2 in. diam., globose, usually 1-seeded.

Common throughout the Hills up to 5,000 ft.: Málköf, Rájpur, Dhárágádh and other valleys, Thadiár, etc.

The stem yields an abundance of watery sap which can be drunk.

Fl. Apr.-June. Fr. July-Sept.

3. **V. latifolia**, Roxb.; Fl. Br. Ind. i. 652; Brandis For. Flora 99, Ind. Trees 177; Gamble Man. Ind. Timb. 190. Vern. *Pánibel*. Hind.

A large climber; stem soft, very porous, furrowed and corky outside when old; branches glabrous. Leaves simple, 3.7 by 4.8 in., suborbicular, cordate, 5-angled or 5-lobed, dentate, membranous, tomentose beneath when young, 5-nerved at the base; lateral nerves 3.7 pairs above the base; nerves and veins always more or less pubescent beneath; petiole 2.4 in. long; tendril slender, forked, one of the forks developing into inflorescence. Flowers reddish-brown, in compound pyramidal panicles. Petals distinct. Stigma sessile

Berry '3.4 in. diam. black, 2-seeded; seeds elliptic, rugose on the margins.

Common in the Dun and Sanabanpur Forests, generally climbing on Sal and other tall trees.

The stem yields when cut a large quantity of good potable water, which is a great relief to coolies working in dry waterless forests.

Leaflets Nov.-Mar. Fl. May-July. Fr. Oct.-Dec.

4. V. parvifolia, Roxb.; Fl. Br. Ind. i. 652; Brandis For. Flora 99, Ind. Trees 177.

A slender woody climber, wholly glabrous. Leaves simple, 1-2.5 by '7-2 in., triangular-ovate, acuminate, denate of very distantly serrate, sometimes lobed, membranous but tough, quite glabrous; lateral nerves 3-5 pairs above the cordate and 5-nerved base; tendrils 2-fid. Flowers minute, green, on slender umbellately-clastered pedicels; clusters arranged on simple or divided erect leaf-opposed racenes; pedancle '5-7 in. long; pedicels '2 in. long, filiform, much thickered in fruit. Petals cohering at the apex. Style distinct, short. Fruit about '3 in. diam., 1-seeded, globose, black when ripe.

Fairly common in Jaunsar and Tehri-Garhwal and the Outer Himalaya, 3,-6,000 ft.: Malkot; below Mussoorie; Saia, Korwa, Dharagadh; Thadiar, Bamsu, etc.

Fl. Apr., May. Fr. June, July.

Closely allied to the last two species is the European Grape Vine, V. vinifera, Linn.; Fl. Br. Ind. i. 652. Vevn. Angur-ki B.l., Hind.—which is cultivated to some extent in the Dún and at Saháranpur, but does not bear good fruit, as the time for it to ripea comes in the rainy season, when there is not sufficient sunshine.

5. V. semicordata, Wall., var. Reylei, King Journ. As. Soc. Beng. lxv. Part ii. p. 113; Brandis Ind. Trees 178; Gamble Man. Ind. Timb. 190; Fl. Br. Ind. i. 655. Syn.—V. himalayana, Brandis For. Flora 100. Vern. Kandár (Báli), Pánlu-ki Bál, Jaunsar.

A large woody climber with smooth bark, generally not twining. Leaves 3-foliolate. Leaflets 2-4 by 1.5-2 in., the lateral very obliquely ovate, the terminal rhomboidal or elliptic, acuminate, serrate or dentate, pilose along the nerves beneath; lateral nerves about 8 pairs; common petiole 1-3 in.; petiolule 1-2 in.; tendril 0. Flowers yellowish-green, in compound trichotomous leaf-apposed cymrs. Style short, stout. Fruit 3-4 in. diam., 4-sided, black when ripe.

JAUNSAR and TEHRI-GARHWAL, 3,-9,000 ft.; common.

Wood brown, hard, mottled with a pretty silver-grain, capable of being used for picture-frames.

Fl. Apr., May. Fr. Aug., Sept.

6. V. capriolata Don; Fl. Br. Ind. i. 659; Brandis For. Flora 101; Ind. Trees 178.

A slender wiry climber. Leaves pedately quinquefoliolate. Leaflets very variable, '5-4 by '3-1'3 in., obovate to narrow-lanceolate, acute or acuminate, the lateral more or less oblique, cuspidately serrate, membranous, glabrous; petiole 1-3 in.; secondary petiolule '1-'15 in.; ultimate petiolule minute or 0; tendrils slender, smooth, generally forked near the end. Inflorescence a compound umbel, or simple umbels cymosely arranged; peduncle 1.5-2 in. long, usually with several conspicuous bracts; ultimate pedicels about '2 in. long. Flowers 4-merous. Stigma sessile, flat. Fruit about '4 in. long, globose, 2-4-seeded, black when ripe.

Valleys in JAUNSAR and TEHRI-GARHWAL, and the OUTER HIMALAYA near Mussoorie, 3,-7,000 ft., usually on trees or rocks in shady places. Also at Robber's Cave and elsewhere in the Dun.

Fl. Aug., Sept. Fr. Oct., Nov.

2. Leea, Linn.; G. P. n. 3.

Erect shrubs or herbs. Leaves usually alternate, simple or 1-3-pinnate, dilated at the base into a sheath. Flowers in leaf-opposed compound corymbose cymes. Calyx 5-toothed. Petals 5, more or less connate at the base and adhering to the staminal tube. Stamens 5, united at the base into a tube; free end of filaments short, reflexed. Ovary 3-6-celled, inserted on the disk; ovules solitary in each cell; style short.

Analysis of the Species.

द्धाः स

Leaflets abruptly long-acuminate,
scabrous; flowers green . . 2. L. alata,
Laflets abruptly long-acuminate,
scabrous; flowers green . . 2. L. appers.

1. L. alata, Edgew.; Fl. Br. Ind. i. 665; Brandis For. Flora 102, Ind. Trees 179; Gamble Man. Ind. Timb. 191; Revision by Mr. C. B. Clarke in Trimen's Journal of Botany, x. 101.

A large perennial herb. Leaves imparipinnate; petiole grooved, winged. Leaflets 5.7, 6.12 by 1.2.5 in., oblong, acute, serrate, glabrous but rough with minute elevated dots, sessile or the lowest pair shortly petioluled; lateral nerves 8.12 pairs; base acute or rounded. Cymes compact, corymbosely branched, 2-3 in. across; reduncle 2-6 in. long, furrowed, rough with elevated glandular dots. Flowers small, red. Anthers united. Fruit 3.4 in. diam., reddishpurple, succulent.

Fairly common in the Don; Dehra, Lachiwala, etc.

Fl. June, July. Fr. Sept., Oct.

2. **L. aspera**, Edgew.; Fl. Br. Ind. i. 665; Brandis For. Flora 102, Ind. Trees 180; Gamble Man. Ind. Timb. 191; Revision by Mr. C. B. Clarke in Trimen's Journal of Botany, x. 136. Vern. Kawá Okhár, Jaunsar.

A large perennial herb. Leaves simply imparipinnate, or the lower often bipinnate. Leaflets (or pinnæ) 2-3 pairs, 3-6 by 2-3 in., ovate or ovate-oblong, abruptly long-acuminate, obtusely crenate, scabrous; lateral nerves 12-16 pairs, straight; base rounded or subcordate; common petiole not winged, of variable length; ultimate petiolule slender, '2-'7 in. long. Corymbs sessile (so as to appear clustered) or shortly peduncled. Flowers small, green. Anthers not united. Fruit '3-'4 in. diam., succulent, black when fully ripe.

Common in ravines in the Dtn. Also in Jaunsar up to 6,000 ft.

The ripe fruit is eaten.

Fl. June, July. Fr. Oct., Nov.

Order 4.—SAPINDALES.

FAM. 28. SAPINDACEÆ; G. P. N. 51.

Trees or shrubs. Leaves various. Flowers usually polygamous. Calyx 4-5-lobed; lobes more or less connate. Petals 4-5 or 0, imbricate, often hairly at the base within. Stamens hypogynous, 5-10, generally 8;

filaments often pubescent. Disk complete or one-sided. Ovary sometimes eccentric, 1-4, generally 3-celled; ovules 1-2 in each cell, ascending; style simple or divided, usually terminal. Fruit various. Seeds generally exalbuminous, sometimes arillate, usually with a large hilum.

Analysis of the Genera.

Flowers irregular. (Leaves opposite, exstipulate, digitate;	
fruit a leathery capsule)	1. Æsculus.
Flowers regular.	*
Leaves alternate, exstipulate.	
Leaves paripinnate; fruit indehiscent.	
Fruit dry; seeds in a fleshy arillus	2. Schleichera.
Fruit fleshy or coriaceous; seeds not	
arillate	3. Sapindus.
Leaves simple; fruit a membranous	
capsule	5. Dodon ÆA.
Leaves opposite, exstipulate, palmately	
lobed or undivided; fruit a double	
samara	4. ACER.
Leaves opposite, stipulate, trifoliolate or	
pinnate; fruit an inflated membra-	
nous capsule	6. STAPHYLEA.
•	

1. Æsculus, Linn.; G. P. n. 21.

1. **Æ. indica**, Colebr.; Fl. Br. Ind. i. 675; Brandis For. Flora 103, t. 19, Ind. Trees 185; Gamble Man. Ind. Timb. 193. The Horse-chestnut tree. Vern. *Pangár*, *Bankhór*, *Kándur*, *Kandár*, Jaunsar.

A large tree with scaly buds; the old bark peeling off upwards in long thick bands. Leaves opposite, digitate, exstipulate, deciduous; common petiole 4-6 in. long. Leaftets 5-9, 6-10 by 2-3-5 in., the centre ones largest, oblanceolate or oblong, acuminate, sharply serrate, glabrous; lateral nerves 15-22 pairs, arcuate; base acute; petiolules 2-1 in. long; bud scales about 1-5 in. long, oblong, membranous, caducous. Flowers white, horizontal, in large thyrsoid cyme-bearing terminal panieles. Calyx 2-3 in. long, tubular, with

5 short rounded lobes, often split longitudinally in open flowers. Petals 4, the place of the 5th usually vacant, white and yellow, '6-'8 in long, clawed, unequal in breadth. Stamens 7, filiform, curved upward, longer than the petals; anthers versatile. Disk one-sided. Orany sessile, 3-celled; style simple, slender. Fruit a 1-3-celled capsule, 1.52 in long, ovoid, rough outside. Seeds exalbuminous, about 1.25 in diam., dark-brown, smooth, shining; hilum about 5 in diam.

Shady ravines in Jaunsar and Tehri-Garhwal, 5,-10,000 ft. Fairly common; abundant about Lokhár.

Wood of a cream-colour, soft and close-grained; pores small; medullary rays very fine and numerous; weight about 35 lbs. perc. ft. It is turned into cups, dishes and platters which are used to hold milk, ghee, etc., and are in common use in the Hills. The fruit is given to cattle and goats, and the embroyo is eaten by the hill people ground and mixed with flour.

Fl. Apr.-June. Fr. July-Oct.

2. Schleichera, Willd.; G. P. n. 41.

1. S. trijuga, Willd.; Fl. Br. Ind. i. 681; Brandis For. Flora 105, t. 20, Ind. Trees 189; Gamble Man. Ind. Timb. 194. Vern. Gausam, Gosum, Kusam, Hind.

A large umbrageous tree; bark grey, exfoliating in plates of irregular shape, red inside. Leaves paripinnate, thin and of a pink colour when very young, coriaceous and dark-green when old; rachis 3-5-in. long. Leaflets 2-4 pairs, opposite, 2-9 by 1.5-3.5 in., oblong elliptic ovate or obovate, subsessile, quite entire, glabrescent, the terminal pair much the largest; main lateral nerves 12-20 pairs. Flowers yellowish-green polygamous, fascicled on simple or compound interrupted drooping racemes which are 3-5 in. long and crowded near the ends of the branches; some trees produce only male flowers. Calyx cup-shaped, about 'l in arcoss. Petals 0. Disk complete, wavy. Stamens 5-8, inserted within the disk, much exceeding the calyx. Ovary 3-4-celled; ovules solitary in each cell; style simple; stigma 3-4-celeft. Fruit '6-'8 in. diam., 1-celled, globose, abruptly tapering to a point, dry, indehiscent. Seeds in a pulpy aril having an acid taste.

Somewhat scarce in the Don Forests, except at Thane, Sainkot, Khairi, etc., but very common along the foot of the Sahabanpur Siwaliks, and in the Lower Himalaya and Himalayan Valleys, e.g., Kálsi, Málköt, etc.

The wood is reddish-brown, very hard, and marked with white wavy concentric lines; weight about 70 lbs. per c. ft. It is used for oil and sugar mills, naves of carts, and such other purposes. The lac produced on this tree is considered to be of the finest quality. The young fruit is pickled and the acid pulp of the ripe fruit is eaten. The seed yields a fat oil which is used to burn. The tree is kepped for fodder.

New leaves and fl. Mar., Apr. Fr. Aug.-Oct.

3. Sapindus, Linn.; G. P. n. 43.

1. **S. detergens**, Roxb.; Brandis For. Flora 107; Gamble Man. Ind. Timb. 196. Syn.—S. *Mukorosei*, Gærtn.; Fl. Br. Ind. i. 683; Brandis Ind. Trees 191. The Soap-nut tree. Vern. Rithá, Hind.

A handsome tree, somewhat resembling the Tún; bark grey. Leaves alternate, paripinnate, 12-20 in. long. Leaflets 5-10 pairs, opposite or alternate, 3-5-6 by 1-2 in., gradually smaller towards the apex of the rachis, lanceolate, acuminate, entire, coriaceous, glabrous; lateral nerves numerous; petiolule 1-2 in. long. Inflorescence a terminal thyrsus or a compound cymose panicle. Flowers small, regular, polygamous. Calyx-lobes somewhat unequal, ciliate. Petals white or purplish, alternating with the calyx-lobes, ciliate. Stemens 8, inserted in the centre of the disk; filaments white-woolly; anthers versatile. Ovary usually 3-celled. Fruit a fleshy globose 1-seeded drupe, '7-1 in. diam.; seed smooth, black, loose inside when dry; the saponaceous pericarp wrinkled and somewhat translucent in the dry fruit.

Cultivated in the Dún, as well as in Jaunsan, e.g., near Thádiar, Lokhár, etc.,—possibly, but somewhat doubtfully, indigenous.

Wood light-yellow, moderately hard, compact and close-grained, weighing about 44 lbs. per c. ft. It is not used. The tree is much valued for the fruit, which is a good substitute for washing-soaps, to which it is considered even superior in the case of woollen or silk fabrics. The leaves are given as fodder to cattle.

Fl. May, June. Fr. Oct.-Jan.

4. Acer, Linn.; G. P. n. 60.

The Maples.

Trees with scaly buds. Leaves opposite, palmately lobed or undivided. Flowers regular, usually polyga-

mous. Calyx usually 5-parted, deciduous. Petals as many as the calyx-lobes, sometimes absent. Disk thick, annular, glabrous; margin lobed. Stamens generally 8, inserted on the disk; filaments usually longer in the male than in the hermaphrodite flowers. Ovary 2-lobed, laterally compressed, usually 2-celled; style deeply 2-fid. Fruit a double samara with membranous reticulate wings, indehiscent; seeds usually solitary.

Analysis of the Species.

Leaves undivided, margins entire.			
Leaves white beneath; petiole 7-4 in. long.			oblongum.
Leaves green beneath; petiole 2.5 in.			
long	2.	A.	lævigatum.
Leaves 5-lobed, margins serrate.			
Leaves pale beneath.			
(Serratures large and obtuse)	3.	A.	cæsium.
Leaves green beneath (sometimes 3-lobed).			
Serratures distant, acumen short	4.	A.	villosum.
Serratures close, acumen long	5.	A.	caudatum.
Leaves 5-7-lobed, margins entire	6.	\boldsymbol{A} .	pictum.

1. A. oblongum, Wall.; Fl. Br. Ind. i. 693; Brandis For. Flora 110, Ind. Trees 181; Gamble Man. Ind. Timb. 199. Vern. Pångoi, Parångá, Jaunsar; Kirmolá, Kirmoli, Garhwal.

A middle-sized tree; bark grey, smooth, with horizontal wrinkles; stem often irregularly buttressed at the base. Leaves 2.5-6 by '7-2'5 in., oblong or ovate-lanceolate, acuminate, entire, glaucous beneath; lateral nerves 6-8 pairs; base rounded, rarely subacute, 3-nerved; petiole '7-4 in. long, terete, flexuose, cond-red. Flowers pentamerous, in terminal or leaf-bearing lateral corymbose panicles; pedicels and calyx hairy. Sepals and petals '1 in. long, linear-oblong. Stamens 8, exserted, glabrous. Ovary hairy. Fruit glabrous; nuts more or less angular; wings 1 in. long, contracted at the base, divergent, almost straight at the back.

OUTER HIMALAYA and HIMALAYAN VALLEYS up to 6,500 ft., e.g., Málköt Hills, Tons Valley, ravines below Mohná, etc. Also in marshy localities in the Don such as Nakraunda, Lachiwála, Mothronwála, etc.

Wood light reddish-brown, moderately hard, close-grained, weighing about 45 lbs. per c. ft. It is used for agricultural implements and made into drinking cups.

Fl. Feb.-Apr. Fr. Rainy season.

2. A. lævigatum, Wall.; Fl. Br. Ind. i. 693; Brandis For. Flora 110, Ind. Trees 181; Gamble Man. Ind. Timb. 200.

A fairly large tree with yellowish or ash-coloured smooth bark; stem often irregularly buttressed. Leaves 2.5.5 by 1.2 in., oblong, acuminate, entire or obscurely sinuate, coriaceous, glabrous, strongly reticulate, green beneath; main lateral nerves about 6 pairs, the basal pair faint and intramarginal; base rounded or more or less acute; petiole 2.5 in. long, channelled. Flowers in lax terminal panicles. Sepals 5, ovate, smaller than the petals. Petals white, about 1 in long, obovate, clawed. Stamens 5.8, exserted, glabrous. Ovary hairy. Fruit glabrous; nuts ovoid, not angular; wings 66.1 inlong, divergent, tinged with red until mature, back straight.

Mussoorie, in valleys at 6,-7,000 ft.; scarce.

Wood white, shining, hard and close-grained, weighing 43 lbs. per c. ft. It is used for building in Nepal and for tea-boxes in Assam.

Fl. Mar., Apr. Fr. July, Aug.

3. A. cæsium, Wall.; Fl. Br. Ind. i. 695; Brandis For. Flora 111, t. 21, Ind. Trees 183; Gamble Man. Ind. Timb. 201. Vern. Kainju, Bara Kainju, Kainjal, Jaunsar.

A large handsome deciduous tree; stem generally rough with knotty excrescences known as burrs; bark grey, exfoliating in thin, vertical strips. Bud-scales 1'5-2 by '3-'5 in., reddish, white-pubescent. Leaves 3-6 in. diam., rather broader than long, 5-lobed, cordate, serrate, pale beneath, generally bright-red, especially when young; petiole 3-5 in. long, rather stout, flattened at the base. Flowers yellowish, in cymosely branched terminal corymbs, appearing with the leaves. Petals small, cream-coloured. Stamens short, longer on male trees. Fruit glabrate; nuts gibbous; wings 1'5-2 in. long, alightly divergent, or in some forms erect and overlapping at the inner edges; back somewhat curved.

HIMALAYAN FORESTS from 6,-10,000 ft., fairly common, generally in open places like grazing grounds.

Wood whitish, close-grained, soft or moderately hard; weight 40 lbs. per c. ft. It is scarcely used excepting that the burrs are sometimes made into cups.

New leaves and fis. Apr., May. Fr. July-Oct.

4. A. villosum, Wall.; Fl. Br. Ind. i. 695; Brandis For-Flora 111, Ind. Trees 182; Gamble Man. Ind. Timb. 201. Vern-Kainiu, Jaunsar.

A fairly large deciduous tree with thin grey bark which is scarcely rough. Leaves 4-6 in. diam., generally as long as broad, 5-lobed or by suppression 3-lobed, cordate, irregularly dentate, deep-green, young with silky hairs beneath; petiole 2-5.5 in. long, rather stout. Flowers 5-merous, in compound lateral racemes, appearing before the leaves; pedunoles and pedicels stout, hairy. Sepals about 1 in. long, oblong, ciliate, 3-nerved. Petals about as long as the sepals but narrower, also ciliate. Stamens 5-8, exserted, glabrous. Fruit generally rusty villous; nuts quadrant-shaped, 3-4 in. long; wings 2 by 8 in., divergent, incurved at the back, membranous at the inner edge.

Jaunsar and Tehri-Garhwal, 7,-9,000 ft.: Deoban, Konáin, Mundáli; Deotá, etc.

Wood white, moderately hard, close-grained, beautifully mottled; weight 38 lbs. per c. ft. It is seldom used except for fuel. The leaves are lopped for fodder.

Fl. Feb., Mar. Fr. June-Aug.

5. A. caudatum, Wall.; Fl. Br. Ind. i. 695; Brandis For. Flora 112, Ind. Trees 183; Gamble Man. Ind. Timb. 201. Vern. Kainjli, Kanjlá, Jaunsar.

A sparingly branched moderate-sized deciduous tree; bark dark-grey, on young stems and branches dark-green or greenish-red, quite smooth. Leaves 2:5-5 by 2-3:5 in., 5-lobed, the two outer lobes smaller than the rest or absent; lobes caudate-acuminate, pointedly seriate to within 5 in. of the tip of the narrow acumen which is 1:5-2:5 in. long; petiole 2-4 in. long, flattened and subamplexicaul at the base. Flowers in terminal and lateral racemes, appearing shortly after the leaves; pedicels 1-2 in. long, very slender. Sepats 2 in. long, oblong, whitish-green. Petals somewhat shorter than the sepals, white, obovate, clawed. Stamens generally 4-6, exserted. Fruit glabrous; nuts irregularly grooved or pitted; wings about 1 in. long, erect or divergent, membranous except at the outer edge, undulate at the inner edge.

JAUNSAR and TEHRI-GARHWAL, 8,-11,000 ft.: Deoban, Konáin; Deotá, etc.; generally affecting open ravines on shady aspects.

Wood whitish, compact and moderately hard, seldom used; weight 43 lbs. per c. ft.

Fl. Mar., Apr. Fr. July-Sept.

6. A. pictum. Thunb.; Fl. Br. Ind. i. 696; Brandis For. Flora 112, Ind. Trees 183; Gamble Man. Ind. Timb. 202. Vern. Kainchli. Kabási, Dúdh Kainju, Jaunsar.

A moderate-sized handsome tree with thin grey bark. Leaves 2-5 by 2.5-7 in., broader than long, 5-7-lobed, rather membranous, glabrous, turning red before falling: margins quite entire: base usually deeply cordate, rarely truncate; petiole 1-6 in. long, slender. flexuous. Flowers glabrous, on slender pedicels arranged in terminal or lateral corymbs. Sepals about '1 in. long, oblong. Petals as long as the sepals, spathulate. Stamens 8, shorter than the petals. Fruit glabrous; nuts thin; wings 1-1-3 in. long, very divergent, with the back sigmoidly curved.

JAUNSAR and TEHRI-GARHWAL, 5,-9,000 ft., the most common of all high-level maples.

Wood white, moderately hard and close-grained, used for ploughs, bedsteads, etc. Tibetan drinking-cups are made of the knotty excrescences (burrs).

Fl. Apr., May. Fr. June, July.

5. Dodonæa, Linn.; G. P. n. 63.

1. D. viscosa, Linn.; Fl. Br. Ind. i. 697; Brandis For. Flora, 113, Ind. Trees 186; Gamble Man. Ind. Timb. 202. Vern. Sonátta, Waláyti Mehndi, Hind.

An evergreen shrub with glabrous red branchlets. Leaves alternate, simple, exstipulate, subsessile, 1.5-3 by 2-1 in., oblanceolate to linear-cuneate, coriaceous, glabrous, shining above, more or less viscid with a yellow resin (whence the specific name); lateral nerves numerous, not very prominent. Inflorescence a short terminal paniele with racemose branches. Flowers polygamous, about 2 in. across. Sepals usually 5, about 1 in. long, oblong, greenish-yellow. Petals 0. Stamens generally 8; filaments short; anther-cells comparatively large. Disk obsolete in the male flowers, small in the female. Ovary 3-4-celled, with 2 ovules in each cell; style 3-4-cleft at the apex. Fruit a compressed capsule, septicidally 2-4-valved. each valve with an oblong membranous wing which is about 5 by 3 in.

Lower Himalaya, about 4,500 ft. Cultivated in the Dún and SAMÁRANPUR DISTRICTS in hedges round gardens and railway-platforms.

Wood hard, compact and close-grained, capable of being used for engraving. The branches are used to support the earth of flat roofs. "The shrub grows readily from seed without much water in arid places"—Sir D. Brandis; and "is likely to be important in recolothing denuded tracts."—Mr. J. S. Gamble. It makes an excellent hedge.

Fl. Aug.-Feb. Fr. Jan.-June.

6. Staphylea, Linn.; G. P. n. 71.

1. **S. Emodi**, Wall.; Fl. Br. Ind. i. 698; Brandis For. 114, Ind. Trees 181; Gamble Man. Ind. Timb. 203. Vern. Chitrá, Márchhob, Jaunsar; Nágdaun, Hind.

A large shrub; bark with grey and dark-brown reticulate streaks. Leaves 3-foliolate; stipules linear, about 1 in. long. Leaflets 3-6 by 1.5-3 in., ovate or elliptio, acuminate, closely serrate, membranous, white-pubescent beneath when young, the lateral very shortly petioluled or sessile, often somewhat oblique; main lateral nerves 6-8 pairs; common petiole 3-6 in., petiolule of the terminal leaflet 5-2 in. long; stipules and stipels caducous. Flowers 2-sexual, regular, 5-merous, 5 in. long, in dense pendulous oymes. Sepals and petals similar, white, erect. Disk 5-lobed. Stamens 5, inserted between the lobes of the disk. Ovary 2-3-celled; styles 2-3, more or less connate. Fruit an inflated membranous capsule, 2-3 in. long, 3-lobed, 3-celled; cells tapering to a tail and dehiscing from the apex.

Shady ravines in the Himalaya, 5,000 to 9,000 ft.: Jhálkúri Mundáli, Kathián, Deotá, Lambátach, etc.

Wood white, soft, weighing about 44 lbs. per c. ft. Walkingsticks are made of the long straight branches with the bark unstripped, which, if cut on a Sunday and not shod with iron, are believed to have the property of keeping off snakes.

Fl. Apr., May. Fr. July, Aug.

To this Family belongs the Lichi. Nephelium Litchi, *Camb.; Fl. Br. Ind. i. 687; which is commonly cultivated in the Dún and yields an excellent fruit, the edible part being the fleshy aril. Vern. Lichi. Hind.—G. P. n. 47.

FAM. 29. SABIACEÆ; G. P. N. 52.

Climbing or erect shrubs, or trees. Leaves alternate, exstipulate, usually simple. Flowers small, 1-2-sexual, generally in panicles. Calyx 4-5-cleft; lobes imbricate. Petals 4-5, imbricate, sometimes unequal. Stamens 4-5, inserted below the ovary and opposite to the petals. Disk small, annular. Ovary 2-3-celled, compressed or lobed; ovules 1-2 in each cell; styles 2-3, free or connate. Fruit a drupe or of 1 or 2 dry carpels; seeds with a broad hilum.

Analysis of the Genera.

Climbers. Petals and stamens equal, the latter all fertile 1. Sabia.

Trees. Petals and stamens unequal, only 2 stamens fertile 2. Meliosma.

1. Sabia, Colebr.; G. P. n. 1.

Scandent shrubs. Leaves simple, entire. Flowers usually 2-sexual, solitary or in cymes or panicles, each subtended by a pair of opposite bracts. Calyx-lobes and petals 4-5, equal. Stamens 4-5, all fertile. Disk 4-5-lobed. Ovary 2-lobed; styles 2, more or less cohering. Fruit of 1 or 2 dry carpels.

Analysis of the Species.

Flowers large, solitary or fascicled . . . 1. S. campanulata. Flowers small, in large panicles . . . 2. S. paniculata.

1. **S. campanulata**, Wall.; Fl. Br. Ind. ii. 1; Brandis For. Flora 116, Ind. Trees 193; Gamble Man. Ind. Timb. 204.

A climber with woody branches. Leaves 1.3.5 by 4.1.3 in., oblong-lanceolate, acuminate, membranous, soft, puberulous, pale

beneath; nerves reticulate; petiole 2.6 in long, channelled, ciliate, Flowers 5 in across, green or pale-yellow with a dash of purple, usually solitary in the axils of the leaves; pedunole 1.2 in long. Sepals minute. Petals 2.3 in long, orbicular, enlarging in fruit. Stamens included. Fruit 3.4 in diam., of two distinct turquoise-blue compressed reniform carpels; seeds rugose.

JAUNSAR and TEHRI-GARHWAL, 5,-10,000 ft. in shady places; common, though not prevalent.

Fl. Apr., May. Fr. Rainy season.

2. S. paniculata, Edgew.; Fl. Br. Ind. ii. 3; Brandis For. Flora 117, Ind. Trees 194; Gamble Man. Ind. Timb. 204.

A large climber with a dark-grey stem. Leaves 3-8 by 1.3-3 in., oblong-lanceolate, acuminate, tough, coriaceous, dark-green and shining above, pale and strongly reticulate beneath main lateral nerves 6-8 pairs; base rounded; petiole 4-7 in. long. Flowers yellowish, 15-2 in. across, in large lateral often leaf-bearing panicles; pedicels hairy. Drupe 3 in. diam., orbicular, compressed.

Shady swampy places in the Dún such as Mothrchwala, Gulargháti, Kaluwala, Nakraunda, etc.

Fl. Feb., Mar. Fr. June-Aug.

2. Meliosma, Bl.; G. P. n. 2.

Trees or erect shrubs usually with hairy extremities. Leaves simple, rarely pinnate. Flowers minute, in large thyrsoid panicles. Sepals and petals 4-5, unequal. Stamens generally 5, two fertile and adnate to the smaller petals, the rest without anthers. Disk 4-5-toothed. Ovary sessile, usually 2-celled. Fruit a drupe, obliquely globose, with a hard kernel; seed solitary.

Analysis of the Species.

Leaves soft, lateral nerves close and straight;
flowers pedicellate . . . 1. M.dilleniæfolia.

[aves hard, lateral nerves distant and arouate; flowers sessile . . . 2. M. pungens.

M. dilleniæfolia, Bl.; Fl. Br. Ind. ii. 4; Brandis For. Flora 115; Ind. Trees 195; Gamble Man. Ind. Timb. 205. Vern. Goi. Jaunsar.

A small deciduous tree; young parts covered with rusty pubescence; bark ashy-grey. Leaves 4-12 by 2-5 in., obovate or elliptic, abruptly acuminate, cuspidate-serrate, membranous, rough with minute raised dots above, rusty-pubescent beneath; lateral nerves 15-20 pairs, straight and parallel; base acute; petiole 5-1 in. long. Flowers 2-sexual, bracteate, in large lax terminal panicles, which extend downward with branches at the axils of the upper leaves. Sepals 5, ciliate, the two outer smaller. Petals 5, orbieular, white, the two attached to the stamens smaller. Drupe '1 in. diam., globose, black when ripe.

JAUNSAR and TEHRI-GARHWAL, up to 10,000 ft., in shady ravines; common in the Bájámárá and Kcnáin Blocks.

Wood dull-white, soft, coarse-grained, used only for fuel.

Fl. May-July. Fr. Aug.-Oct.

2. **M. pungens**, Wall.; Fl. Br. Ind. ii. 4; Brandis For. Flora 116, Ind. Trees 194; Gamble Man. Ind. Timb. 205. Vern. Búshkvá, Bushá, Jaunsar; Kharás, Garhwal.

A small tree with grey bark; young parts covered with rusty pubescence. Leaves 5-10 by 1-3 in., oblanceolate, abruptly long-acuminate, very distantly cuspidate-serrate, hard, coriaceous, pulescent beneath along the midrib and nerves; lateral nerves 8-10 pairs, arcuate, prominent beneath; base very gradually narrowed; petiole 2-7 in. long. Flowers small, sessile, in large compact panicles, supported by 1 or 2 bracteoles which resemble the sepals. Sepals round, ciliate. Petals membranous, whitish, three large and entire supporting as many staminodes, and two smaller and bilobed supporting 2 fertile stamens. Drupe 3 in. diam., globose.

JAUNSAR and TEHRI-GARHWAL, 4-8,000 ft., generally in ravines and along streams; Lokhár, the Ámláwa and Tons Valleys, etc.

Wood soft, of no special value.

Fl. May, June. Fr. July, Aug.

FAM. 30. ANACARDIACEÆ; G. P. N. 53.

Trees or shrubs, generally with milky or resinous juice. Leaves usually alternate, simple trifoliolate or

pinnate, exstipulate. Inflorescence generally a terminal panicle, less frequently lateral or axillary. Flowers small, mostly regular, unisexual or bisexual. Calyx 3-5-cleft. Petals free, as many as the calyx-divisions and alternating with them, sometimes absent. Disk usually annular. Stamens generally as many or twice as many as the petals, inserted under (rarely on) the disk, sometimes not all perfect. Ovary superior or half-inferior, usually 1-celled and 1-seeded. Fruit a drupe. Seed exalbuminous.

Analysis of the Genera.

Fruit 1-celled, 1-seeded.	
Pericarp dry.	
(Leaves simple or compound, petals 4-3).	l. Rhus.
Pericarp more or less fleshy.	
Leaves simple.	
Receptacle of fruit enlarged and fleshy	6. SEMECARPUS.
Receptacle of fruit not enlarged or fleshy.	
Stamens 1-5, generally only 1 perfect .	3. Mangifera.
	4. BUCHANANIA.
Leaves pinnate.	
Petals none	2. PISTACIA.
Petals 4-5	5. Odina.
Fruit 2-5-celled, 2-5-seeded; pericarp fleshy;	
	7. Spondias.

1. Rhus, Linn.; G. P. n. 1.

Trees or shrubs with a resinous or acrid juice. Leaves 3-foliolate or pinnate, rarely simple. Flowers small, polygamous, panicled. Calyx-limbs 4-6. Petals 4-6, imbricate. Disk fleshy, annular. Stamens 4-10, inserted at the base of the disk. Ovary sessile, 1-celled; styles 3. Drupe dry, with a pendulous seed.

Analysis of the Species.

Leaves simple						1. R.	Cotinus.
Leaves 3-foliolate						2. R.	parviflora,
Leaves imparipinn							
Petiole winged;		ts ses	sile)		•	3. R.	eemi-alata.
Petiole not wing							
Leaflets sessil						4. R.	punjabensis.
Leaflets short					llary.		
Innovation			mente	ose			Wallichii.
Wholly gla	brous					6. R.	succedanea.

1. **R. Cotinus**, Linn.; Fl. Br. Ind. ii. 9; Brandis For. Flora 118, Ind. Trees 196; Gamble Man. Ind. Timb. 207. The Wig tree. Vern. *Túng*, *Túngo*i, Jaunsar; *Túngá*, Garhwal.

A shrub or small tree with thin reddish-brown bark; branch-lets red; young parts grey-tomentose. Leaves simple, 2-4 by 1:5-3 in., ovate elliptic obovate or orbicular, entire, usually tomentose beneath, less frequently so above; main lateral nerves 10-15 pairs; base more or less acute; petole 1:5-3 in. long. Flowers about '15 in. diam., on very slender pedicels which are arranged in lax terminal panicles, pedicels of sterile flowers elongated and feathery. Sepals ovate-oblong. Petals elliptic, pale-yellow, much exceeding the sepals. Filaments short; anthers comparatively large. Disk broad, 4-angled. Drupe '2 in. long, compressed, oblique, reddish, covered with white hairs.

Common in JAUNSAB, TEHRI-GARHWAL and OUTER HIMA-LAYAN slopes, 3,-6,000 ft., generally in open sunny places.

Heartwood of a dark yellow colour and mottled, weighing 56 lbs. to the c. ft. It makes very pretty picture-frames and might be used for cabinet-work. The twigs are used for basket-making, and the bark and leaves for tanning. The leaves and flowers emit the characteristic resinous odour of mango when bruised.

New leaves and fis. Apr., May. Fr. Autumn.

2. R. parviflora, Roxb.; Fl. Br. Ind. ii. 9; Brandis For. Flora 119, Ind. Trees 196; Gamble Man. Ind. Timb. 208. Vern. Ninás, Nináwa, Jaunsar; Túnglá, Hind.

A shrub; young parts densely covered with rusty tomentum; bark grey, smooth. Leaves 3-foliolate; common petiole 1-2 in. Leaflets 1-3 by 6-2 in., the terminal much larger than the other two, obovate, orenate, sparsely hairy above, pubescent beneath; the terminal leaflet often narrowed into a marginate petiolule, the

others sessile; lateral nerves 8-12 pairs, straight, prominent. Inforescence a terminal paniels with racemose branchlets, some of which rise from the axils of the upper leaves. Flowers 1 incoross. Sepals ovate. Petals oblong, longer than the sepals. Drupe 2 in. diam., ovoid, glabrous, brown, shining.

JAUNSAB, TEHRI-GARHWAL and the OUTER HIMALAYA, 2,5,000 ft.: Dhárágádh, Tons (Tiuni, Morá Depôt, etc.) and Jumna Vallevs: Málköt. etc.

Wood hard and close-grained. The fruit is eaten, and is used in Hindu medicine.

Fl. May, June. Fr. July, Aug.

3. R. semi-alata, Murray; Fl. Br. Ind. ii. 10; Brandis For. Flora 119, Ind. Trees 197; Gamble Man. Ind. Timb. 208. Vern. Tibri, Arkhoi, Jaunsar.

A small decidous tree; young parts covered with dark-grey pubescence. Leaves imparipinnate, over a foot long turning red before falling; common petiole usually winged. Leaflets 4-6 pairs, opposite, sessile, 2-4 by 1-2 in., elliptic, acuminate, deeply crenate or dentate, glabrous above, soft-tomentose beneath; lateral nerves 10-15 pairs, parallel; base rounded, somewhat oblique. Panicles terminal, 6-8 in. long, conical, dense-flowered. Flowers 'l in. diam., pale-green. Sepals ovate. Petals oblong, ciliate, much exceeding the sepals. Drupe '2 in. diam., subglobose, compressed.

Jaunsar and Tehri-Garhwal, 3,-7,000 ft. : Dhárágádh and Tons Valleys.

Wood soft, shining, white but with darker streaks, weighing about 27 lbs. per c. ft., not used. The fruit is often eaten by the hill people, and is used medicinally.

New leaves and fls. Apr., May. Fr. Aug.-Oct.

4. R. punjabensis, Stewart; Fl. Br. Ind. ii. 10; Brandis For. Flora 120, Ind. Trees 197; Gamble Man. Ind. Timb. 209. Vern. Titri, Titroi, Jaunsar.

A small deciduous tree with rough dark-grey bark and aromatic leaves; young parts covered with short pubsecence. Leaves imparipinnate, over a foot long; petiole and rachis slender, not winged. Leaflets 5-6 pairs, opposite or subopposite, sessile, 3-6 by 1-2·5 in., ovate-oblong or lanceolate, acuminate, entire or serrate near the apex, membranous, pubescent beneath, with scattered hairs above; lateral nerves about 20 pairs, very slender; base rounded. Panicles terminal, compact, much shorter than the leaves. Flowers

less than 1 in. diam., yellowish-green. Drupe about 2 in. diam., on short pedicels, compressed, covered with a dense purplish tomentum.

JAUNSAR and TEHRI-CARHWAL, 3,-8,500 ft., towards the interior; e.p., Lokhár, Kathián; Deotá, etc.

Fl. Apr., May. Fr. Aug., Sept.

5. R. Wallichii, Hook. f.; Fl. Br. Ind. ii. 11; Gamble Man. Ind. Timb. 209; Brandis Ind. Trees 198. Syn.—R. vernicifera, DC.; Brandis For. Flora 120, Vern. Arkhoi, Archei, Jaunear.

A small deciduous tree somewhat resembling the walnut, with smooth grey bark which exudes a black acrid varnish; young parts covered with rusty-brown or ash-coloured tomentum. Leaves imparipinnate, approximate near the ends of the branches; common petiole terete, stout. Leaflets 3-5 pairs, opposite, subsessile, 4-6 by 2-3.5 in., oblong-elliptic, acuminate, entire, grey-tomentose beneath, more or less pubescent above; lateral nerves 20-25 pairs; base rounded, oblique. Panicles short, compact, from the axils of the lower or last year's leaves. Flowers subsessile, 1 in. diam. Sepals obtuse. Petals much larger than the sepals, obovate, greenish-white, with dark veins. Drupes 3 in. diam., much crowded together; perioagp dry, splitting irregularly to form a stellate receptacle for the kernel which is long-persistent and covered with a vegetable wax.

JAUNSAR and TEHRI-GARHWAL, 4,-7,000 ft.; Binálgádh, Dhárágádh, Kathián, Tons Valley, etc.

Sapwood white, soft; heartwood reddish-brown. It is used for saw-frames and axe-handles. The juice of the leaves is corrosive. "In Jaunsar Bawar it is rubbed on thread to strengthen it "—(Sir D. Brandis)—but the Junsaris have a superstition against the tree which is said to be inhabited by an evil spirit, and consequently they most scrupulously avoid touching it or even going near it.

Fl. May, June. Fr. July-Sept.

6. R. succedanea, Linn.; Fl. Br. Ind. ii. 13; Brandis For. Flora 121, Ind. Trees 199; Gamble Man. Ind. Timb. 210. Vern. Arkhol, U. P.

A middle-sized deciduous tree with dark-grey thin bark, somewhat resembling the Tún. Leaves imparipinnate, approximate near the ends of the branches. Leafets 3-6 pairs, opposite, 3-6 by 1.5-3 in., ovate-lanceolate, long-acuminate, entire, thinly coriaceous, usually quite glabrous; lateral nerves 8-15 pairs, alternating with shorter intermediate ones; base rounded acute or oblique; petiolules slender, 2-4 in. long. Panicles axillary, with slender and drooping

ramifications, much shorter than the leaves. Flowers pedicelled, scarcely 'l in. diam., greenish-yellow. Sepals ovate, obtuse. Petals much larger, oblong or obtuse. Disk 5-lobed. Drupes '25 in. diam., compressed, glabrous, rugose, yellow or light-brown; epicarp thin, bursting irregularly; mesocarp fibrous; kernel compressed, hard, surrounded by a vegetable wax.

Tehri-Garhwal, 4,-7,000 ft.; Lambatách, Pájidhár, above Naintwár, etc.

Sapwood white, turning brown, soft; heartwood scanty, yellow; not much used. The juice is acrid, but the snow-white wax is much appreciated in Japan where the tree is planted along road sides for its sake. The wax is made into candles. Lacquer varnish is also obtained by tapping the bark. The acid pulp of the fruit is eaten in Sikkim and Nepal.

Fl. May-Aug. Fr. Aug.-Oct.

2. Pistacia, Linn.; G. P. n. 53.

1. **P. integerrima,** Stewart; Fl. Br. Ind. ii. 13; Brandis For. Flora 122, Ind. Trees 199; Gamble Man. Ind. Timb. 210. Vern. Kakkar, Kákroi, Jaunsar.

A middle-sized deciduous tree with rough grey bark. Leaves alternate, pari- or imparipinnate, 6-9 in. long. Leaflets 4-6 pairs, subopposite, minutely petioluled, 3-6 by 1-1.7 in., lanceolate, long-acuminate, entire, hard, coriaceous, glabrous; main lateral nerves about 20 pairs, slender; base oblique. Inflorescence a lateral paniele. Flowers small, apetalous, diœcious. Male fis.: panieles 2-4 in. long, compact, pubescent; calyx gamosepalous, 3-5-fid; stamens 5-7 on a small disk; anthers large, red. Fem. fis.: panieles 6-10 in. long, lax, thyrsoid; sepals 4, free, linear, deciduous; ovary sessile, 1-celled; styles 3, cohering only near the base. Drupe '25 in. diam., oblique, broader than long, glabrous, rugose.

JAUNSAR and TEHRI-GABHWAL, also the Málkūt Hills, 3-6,000 ft. Ámláwa nálá, Binálgádh, Tons Valley, etc.

Sapwood white; heartwood mottled with yellow and green streaks, very hard and durable, valued as an ornamental timber; weight 54 lbs. per d. ft. "The leaves are lopped for fodder for buffaloes and camels, and the galls $(K\acute{a}krasingi)$ are used in native medicine."—Mr.J.S. Gamble. The latter are in the shape of a horn, attaining 3-6 in. in length, and are dull-red in colour. They are produced by a Hemipterous insect.

New leaves and fis. Mar.-May. Fr. June-Oct.

3. Mangifera, Linn.; G. P. n. 7.

1. **M. indica**, Linn.; Fl. Br. Ind. ii. 13; Brandis For. Flora 125, Ind. Trees 206; Gamble Man. Ind. Timb. 211. The Mango tree. Vern. Ám. Hind. Ámbi, Dún and Saháranpur (vulgar).

A large evergreen tree with rough thick dark-grey bark. Leaves alternate, simple, crowded at the ends of the branches, 6-12 by 1.5-4 in., oblong or obovate-lanceolate, entire, coriaceous, darkgreen, glabrous; margins often wavy; lateral nerves numerous. arcuate: base acute; petiole 1-2.5 in. long, swollen at the base. Inflorescence a terminal panicle about 1 ft. long; bracts elliptic, concave. Flowers about '15 in. across, yellowish-green, scented, male and 2-sexual on the same paniele. Calyx 4-5-partite; segments imbricate, ovate, concave, deciduous. Petals 4-5, imbricate, much longer than the calvx-segments, ovate, yellow, with 3-5 longitudinal ridges. Disk fleshy. Stamens 4-5, inserted on the disk, only one perfect and longer than the rest; filaments subulate. Ovary sessile. obliquely ovoid, glabrous; ovule solitary; style lateral. Drupe 2-6 in. long, ovoid, laterally compressed, with a protuberance on one side near the tip indicating the position of the style; putamen fibrous.

Cultivated and almost wild in Saháranpér and the Dún. Several varieties are recognized under cultivation which differ chiefly in the quality of the fruit.

No distinct heartwood and sapwood. Wood grey, coarse-grained, soft, liable to attacks of insects; weight 41 lbs. per c. ft. It is made into planks, and is as yet the only wood used for tea-boxes in the Dún. Doors and windows and sometimes cheap furniture are made of it. The tree is, however, valued chiefly for its fruit. The green fruit is pickled, and is dried in slices as an article of trade in Bengal and elsewhere. The pulp of the ripe fruit is dried in thin plates, which can then be kept for months without losing flavour. Throughout the United Provinces the kernel of the fruit is dried and pounded into a meal, which is used by the poorer classes during famine as a substitute for wheat-flour.

Fl. Mar., Apr. Fr. June, July.

4. Buchanania, Roxb.; G. P. n. 11.

1. **B. latifolia**, Roxb.; Fl. Br. Ind. ii. 23; Brandis For. Flora 127, Ind. Trees 205; Gamble Man. Ind. Timb. 216. Vern. Piyál or Piál, Hind.; Kath Bhiláwa, Dún.

A moderate-sized tree, almost evergreen; bark dark-grey or black, furrowed into thick small quadrangular plates, reddish inside. Leaves alternate, simple, 6-10 by 2-3.5 in., oblong or elliptic, entire, obtuse at both ends, coriaceous, hard, generally pubescent beneath, closely reticulate; lateral nerves 15-20 pairs, stout, nearly straight; petiole '2-'3 in. long, pubscent. Flowers 2-sexual, sessile, '15-2 in. diam., greenish-white, in terminal and axillary pyramidal panicles. Calyx 5-toothed, persistent. Petals 5, oblong. Disk floshy, 5-lobed. Stamens 10, as long as the petals. Carpels 5, hairy, inserted at the base of the disk, 1 perfect, 4 reduced to thread-like processes. Drupe '5 in. long, ovoid-oblong, black when ripe; stone hard, 2-valved; seeds oily.

Common in the Sál forests of the SIWALIK DIVISION, where the soil is at all clayey. Scarce in the E. Dún beyond the Sông river.

Wood greyish-brown, moderately hard, with a small dark-coloured heartwood, fairly durable if kept dry and free from white-ants. Weight 33 lbs. per c. ft. It seasons well, and is used for boxes, bedsteads, yokes, doors, furniture, and the like. The poles are made into tors in the Saháranpur Division, which are used to support light roofs. The bark is used for tanning. The ripe fruit has a pleasant sweetish-acid flavour, and the kernel, which resembles the pistachio-nuts, is an important article of trade in the Central Provinces, where it is called chironji. The leaves are sometimes used as a substitute for plates.

Fl. Feb., Mar. Fr. May, June.

5. Odina, Roxb.; G. P. n. 22.

1. O. Wodier, Roxb.; Fl. Br. Ind. ii. 29; Brandis For. Flora 123, Ind. Trees 200; Gamble Man. Ind. Timb. 218. Vern. Jhinghan, Hind.; Jinghini, Sans.

A moderate-sized deciduous tree with thick soft branchlets; bark grey, smooth up to middle age, afterwards exfoliating in thin round plates, red inside. Leaves alternate, few at the ends of the branches, imparipinnate, 12-18 in. long, turning yellow before falling. Leaflets 7-11, shortly petiolulate, 3-6 by 2-3-5 in., ovate, long-acuminate, quite entire, rather membranous, glabrous when old; lateral nerves 4 6 pairs, arcuate; base rounded. Flowers 1-sexual, 4-merous, 1-15 in. diam., fascicled on simple and compound racemes which are crowded at the extremities of the still leafless branches; male and female usually on different branches. Bracts numerous, ciliate. Calyx 4-loued, persistent; lobes obtuse, ciliate, about 05 in.

long. Petals longer than the sepals, oblong, spreading, greenish-yellow. Disk annular, 4-lobed. MALE FLS.: racemes panicled; stamens twice as many but as long as the petals, inserted within the disk; anthers versatile. FEM. FLS.: racemes simple; disk surrounded by sterile stamens; ovary sessile, 1-celled, with 3-4 distinct styles. Drupe 6 in. long, oblong, compressed.

Extremely common in the Dún and Saháranpur Forests. Also found at low elevations in the Hills, e.g., near Thadiár.

Sapwood white and soft; heartwood scanty, red when freshcut, afterwards reddish-brown, moderately hard and close-grained, but not durable; weight 50-60 lbs. per c. ft. A useful gum exudes from wounds made in the wood, for which the tree is tapped in April and May on a regular rotation in the Saháranpur half of the SIWALIK DIVISION. The leaves are greedily eaten by cattle, and elephants are fond of the young shoots. The tree can be most easily propagated by cuttings.

Fl. Mar., Apr. Fr. June, July.

6. Semecarpus, Linn. fil.; G. P. n. 25.

1. **S. Anacardium,** Linn. fil.; Fl. Br. Ind. ii. 30; Brandis For. Flora 124; Gamble Man. Ind. Timb. 220. The Marking-nut tree. Vern. *Bhiláwa*, Hind.

A moderate-sized decidous tree with rough dark-brown bark which yields an acrid juice; young parts, leaves beneath, and inflorescence pale-tomentose. Leaves crowded at the extremities of the branches, alternate, simple, 9-24 by 5-14 in., obovate-oblong, often pandurate, entire, rather coriaceous, more or less hispidly pubescent, pale beneath; tip and also the base rounded, or the latter sometimes cordate; lateral nerves 16-24 pairs, stout, slightly arched. Flowers polygamous or diœcious, '2-'3 in. diam., in fascicles on large terminal panicles; bracts lanceolate. Calyx 5-cleft; segments deciduous. Petals 5, oblong, glabrous, greenish-yellow, much longer than the sepals. Disk broad, annular. Filaments subulate. Styles 3. Drupe 1 in. long, the shape of a mango, compressed, shining, black when ripe, seated on an orange-coloured fleshy recepticle formed of the disk, the base of the calyx and the extremity of the peduncle.

Fairly common in the Sal forests of the SIWALIK DIVISION, generally on clayey soil and in the moister localities.

Sapwood and heartwood not distinct. The wood is soft and light, weighing about 35 lbs. per c. ft.; not used. The cup of the

ripe fruit is eaten raw, dried or roasted. The pericarp contains an acrid juice which is used as marking-ink and in medicine.

Leafless Feb.-Apr. New leaves May. Fl. May, June. Fr. Nov.-Feb.

7. Spondias, Linn.; G. P. n. 36.

1. **S. mangifera**, Willd.; Fl. Br. Ind. ii. 42; Brandis For. Flora 128, Ind. Trees 261; Gamble Man. Ind. Timb. 223. The Hog-plum tree. Vern. Ambára, Hind.

A deciduous tree with smooth grey bark, every part of which has a characteristic aromatic smell. Leaves alternate, imparipinnate, 12-18 in. long. Leaflets 9-11, opposite, short-petiolulate, 3-9 by 1.5-4 in., oblong-elliptic, acuminate, entire, soft, rather membranous, quite glabrous, turning bright-yellow before falling : lateral nerves 10-30 pairs, straight, parallel, nearly transverse, joined by a strong intramarginal nerve. Flowers 2 in. diam, polygamous. nearly sessile, in spreading terminal panicles. Clayx 5-toothed. deciduous. Petals 5, about 'I in. long, oblong, greenish-white, spreading. Disk cupular, crenate. Stamens 10, inserted below the disk : filaments subulate, shorter than the petals; anthers versatile. Ovary sessile, free; carpels 4-5, distinct in flower, coalescing into a single stone in fruit; ovules solitary, pendulous; styles as many as the carpels. Drupe 1.5-2 in. long, ovoid or oblong, fleshy, smooth. yellow when ripe; putamen fibrous and pitted with cavities outside, with 2-5 seeds, of which, however, usually only one is perfect.

Fairly common in the Don and Saharangue Forests. Also found in the Tons Valley, Jaunsar and Tehri-Garhwal.

Wood soft, light grey, with large pores, weighing about 26 lbs. per c. ft.; useless even as fuel. The tree is often attacked by insects, and the holes made by them exude a gum which is insoluble in water. The fruit is eaten when ripe, or pickled or made into curries when green and tender. The flower-buds also make a very agreeable curry. The tree can be most easily propagated by cuttings, and is invariably thus planted in hedgerows.

Leafless Dec.-Apr. Fl. Mar.-May. Fr. Cold seasons.

FAM. 31. CORIARIACEÆ; G. P. N. 54.

Glabrous erect shrubs with quadrangular branches. Leaves opposite or in whorls of three, simple, more or less entire, exstipulate. Flowers small, green, 2-sexual or polygamous, usually in axillary racemes. Sepals 5, spreading. Petals smaller than the sepals, fleshy, keeled within, sometimes adnate to every second stamen, accrescent in fruit. Disk none. Stamens 10, hypogynous; filaments short. Carpels usually 5, free, 1-celled; ovule solitary, pendulous; styles fleshy, feathered. Fruit of 5-10 compressed nuts, encircled by the fleshy petals; seeds compressed.

1. Coriaria, Linn.; G. P. n. 1.

1. **C. nepalensis,** Wall.; Fl. Br. Ind. ii. 44; Brandis For. Flora 128, Ind., Trees 209. Gamble Man. Ind. Timb. 224. The Mussoorie-berry. Vern. *Mansúri, Masúri,* Mussoorie; *Mosroi,* Jaunsar; *Gangeru, Gangára*, Tons Valley.

A large shrub with long spreading branches; bark reddishbrown, rough; branchlets quadrangular. Leaves 2-4 by 1-25 in. ovate-oblong, cordate, acuminate, obscurely serrulate, 3-7 nerved at the base, sometimes puberulous beneath; petiole 0-1 in. long. Racemes 2-6 in. long, usually clustered. Flowers 3 in. diam., greenish-yellow. Fruit 2-3 in. diam., dark-brown or black.

JAUNSAR and TEHRI-GARHWAL, 4,-8,000 ft., fairly common among shrubby vegetation on hill-sides and in ravines. Occasionally in the Saháranpur Siwaliks, e.g., Chilláwáli Ráu.

Wood grey, hard, beautifully mottled, and takes a good polish; weight 47 lbs. per c. ft. It is fit to be used for picture-frames and other small articles. The branches are browsed by sheep and goats.

Fl. Apr., May. Fr. June, July.

FAM. 32. MORINGACEÆ; G. P. N. 55.

Deciduous trees with corky bark and soft spongy wood. Leaves alternate, imparipinnately twice or thrice compound; leaflets opposite, entire, caducous. Inflorescence an axillary panicle. Flowers 2-sexual, irregular.

white or pink. Calyx cup-shaped, with 5 deciduous petaloid segments. Petals unequal, erect, spreading. Disk lining the calyx-tube. Perfect stamens 5, opposite the petals, alternating with 5 antherless filaments, all inserted on the edge of the disk and all declinate; anthers 1-celled. Ovary stipitate, lanceolate, 1-celled; ovules numerous, on parietal placentas; style slender, tubular. Fruit a pod-like capsule, rostrate, 3-angled, 3-valved. Seeds many; testa corky, usually winged.

1. Moringa, Lamk.; G. P. n. 1.

1. M. pterygosperma, Gærtn.; Fl. Br. Ind. ii. 45; Brandis For. Flora 129, Ind. Trees 209; Gamble Man. Ind. Timb. 224. The Horse-radish tree. Vern. Sanjná, Sainjná, Sohjná, Sondná, Hind; Shobhánjana, Sans.

A fairly large tree with thick oorky bark; roots pungent. Leaves 1-2.5 ft. long, usually 3-pinnate; petiole sheathing at the base; pinnæ opposite, 4-6 pairs; pinnuiæ opposite, 6-9 pairs, the uppermost pair 1-foliolulate; a hairy gland between each pair of pinnæ and pinnulæ. Ultimate leaflets opposite, '4-'8 in. long, obovate or elliptic, entire, membranous, pale beneath. Flowers 1 in. diam., strongly honey scented. Sepats inear lanceolate, reflexed. Petals .7-'9 in. long, linear-spathulate, white, with yellow dots near the base Filamenus villous at the base. Ovary hairy. Capsule 9-20 by '6-'8 in. 3-gonous, linear, pendulous, longitudinally ribbed, slightly constructed between the seeds. Seeds 3-cornered, winged at the angles, about 1 in. long including the wings.

Common in the Dún along the banks of the Jumná, Sông and Suswá rivers; also found in the Saháranpur Siwaliks, along the ráus and in the Tons valley in Jaunsar and Tehri-Garhwal. Cultivated at Dehra for the fruit.

The wood is absolutely useless, rotting away in a few months. The leaves, flowers, and fruits are eaten as vegetables. The tender fruit is sometimes pickled. Most wild trees, however, produce bitter flowers and fruits which are therefore not edible. The leaves are also lopped for fodder, especially for camels. A gum, obtained by making incision s in the bark, as well as the pungent roots, are used in medicine. The tree is most easily propagated by cuttings.

Fl. Feb-Apr. Fr. May, June.

CALYCIFLOR Æ.

Order 1.—ROSALES.

FAM. 33. LEGUMINOSÆ; G. P. N. 57.

TREES, shrubs or herbs. Leaves alternate, usually compound, stipulate. Inflorescence an axillary or terminal simple raceme or panicle. Flowers 2-sexual, regular or irregular, bracteate. Sepals 5, connate or free, in the former case often 2-lipped. Petals free, usually 5, equal or unequal. Stamens normally 10, sometimes fewer by suppression or indefinite; filaments free or variously combined; anthers usually dehisoing longitudinally. Ovary free, often stipitate; carpel solitary; ovules one or more on the ventral suture of the carpel; style simple. Fruit a pod (legume), usually dehiscent along one or both sutures. Seeds flat or more or less compressed, with a horny or coriaceous testa, very rarely albuminous.

This large and most important Family is divided into three Sub-Families:—

Analysis of the Sub-Families

Petals unequal, free, imbricate; stamens up to 10.

Stamens diadelphous, less frequently monadelphous, rarely free; calyx gamosepalous.

Stamens free; calyx divided to or nearly to the base.

Petals equal, more or less commate, valvate; stamens usually indefinite.

II. Cæsapinieæ.

SUB-FAMILY I. PAPILIONE Æ.

Mostly herbs, less frequently shrubs or trees. Leaves pinnate or digitate; leaflets often stipellate. Flowers 2-sexual, irregular, Caluz gamosepalous, 2-lipped. Corolla of 5 imbricate petals which are more or less clawed, the 2 innermost (which are also anterior) similar. free or connate into a sheath next to the ovary, and are called the keel petals; the next two are immediately outside the keel, also similar, and are called the wings: and the fifth is the outermost or odd petal, called the standard, which is posterior in position and is generally broad and reflexed. This type of corolla is known as papilionaceous, whence the name of the Sub-Order. Stamens generally 10, diadelphous, sometimes monadelphous, rarely free, inserted with the petals on the calvxtube: anthers often versatile. Pod dry, generally dehiscent. Seeds exalbuminous

Analysis of the Genera.

Leaves digitately 3-foliolate; pod compressed; stamens free	. Piptanthus.
Leaves not gland-dotted; stamens monadel-	
	2. Crotalaria. 8. Flemingia.
Leaves imparipinnate.	
Stamens free; (pod moniliform, indehiscent) . 2	O. SOPHORA.
Stamens equally or unequally diadelphous.	
	Dalbergia.
	. T
	3. Indigofera.
Pod compressed; stamens obtuse.	
	i. Millettia.
Pod many-seeded, soon dehiscent	5. Tephrosia.

Leaves paripinnate; stamens diadelphous.	
Unaimed. Pod septate; calyx not oblique.	
Pod long, many-seeded. Erect plants .	6. Sesbania.
Pod short, few-seeded. Climbing shrubs .	11. ABRUS
Armed. Pod not septate; calyx very oblique	
Leaves pinnately 3-foliolate.	************
Stamens diadelphous.	
	8. LESPEDEZA.
Pod dehiscent.	0. 11.01.12.11.11
Pod with articulate joints.	
Trees. Racem's fascicled, on old wood	O OHORINIA
Shrubs. Racemes simple or panicled,	
on current year's shoots (leaves	10 Danses
often 1-foliolate)	IU. DESMODIUM.
Pod without articulate joints.	
Node: of racemes tumid; leaves not	
gland-dotted.	
Petals very unequal; pod few-seeded.	
Keel exceeding the wings and	
standard. Climbing shrubs.	12. Mucuna.
Standard exceeding the keel and	
wings. Trees	13. ERYTHRINA.
Petals equal; pod 1-seeded.	¥"
	14. SPATHOLOBUS.
Flowers large, racemed	15. BUTEA.
Nodes of racemes not tumid; leaves	
	17. RHYNCHOSIA.
Stamens monadelphous (pod dehiscent, not	
	16. PUERARIA.
Jointed, iew-seeded)	IU. IUERARIA.

1. Piptanthus, D. Don; G. P. n. 2.

1. **P. nepalensis,** D. Don; Fl. Br. Ind. ii. 62; Brandis For. Flora 132, Ind. Trees 216; Gamble Man. Ind. Timb. 229. Vern. *Chamba*, *Chamboá*, Jaunsar.

A shrub 8 to 12 ft. high, with green bark. Leaves digitately 3-foliolate; common petiole '7-1.5 in.; stipules connate, opposite to the petiole, '2-3 in. long, broadly triangular, drying brownish-grey, pubescent, deciduous. Leafets sessile, 2-4 by '5-1 in., lanceolate or narrow-elliptic, acuminate, entire, dark-green above, pale beneath; grey-pubescent when young, afterwards glabrous and shining; midrib prominent beneath; main lateral nerves about 12 pairs, faint. Flowers yellow, about 1.25 in. long, in short compact hairy racemes

4-5 in. long; peduncle triquetrous; pedicels '5'7 in. long; bracts ternate, tomentose. Calyx about '5 in. long, campanulate, donsely white-pubescent, deciduous from the base. Petals bright-yellow, all clawed, I in. long including the claw which is about '5 in. long. Stamens 10, free, equal or frequently alternately long and short; anthers uniform. Ovary linear, stipitate, hairy. Pod 3.5 by 4.5 in., flat, narrowed at both ends, on a stipe '8-1 in. long; seeds 3-10.

JAUNSAR and TEHBI-GABHWAL, 7,-9,000 ft. Deoban near "Chakrata View" and below "Snow View"; on the slopes of the Karámbá peak and elsewhere about Mundáli. Common about the temple in the Temple Block, Deotá Forest.

Planted for ornament in the hills on account of its handsome yellow flower.

Fl. Apr.-June. Fr. Aug., Sept.

2. Crotalaria, Linn.; G. P. n. 53.

The Kidney Beans.

Herbs or shrubs. Leaves simple or 3-foliolate, rarely imparipinnate. Flowers yellow blue or purplish, in terminal or leaf-opposed lax racemes. Calyx-tube short; teeth almost equal, or connate and 2-lipped. Corolla generally showy; standard shortly clawed, round; wings and keel of the same length; the latter broader, beaked. Stamens monadelphous, forming an open sheath; anthers alternately versatile and basifixed. Ovary linear; style incurved at the base, bearded. Pod inflated.

This large Genus is noted for strong fibre.

Analysis of the Species.

Corolla much exserted; pod glabrous . 1. C. sericea.
Corolla little exserted; pod densely velvety . 2. C. tetragona.

1. C. sericea, Reta.; Fl. Br. Ind. ii. 75. Vern. Chhanmuna, Hind.; Sanni, E. Dun.

An undershrub 4-6 ft. high with stout but fleshy striated branches. Leaves simple, 3-6 by 2-3.5 in., oblanceolate-oblong, tapering into a short petiole, subcoriaceous but soft, glabrous above, finally silky beneath; stipules leafy, persistent. Racemes terminal, about a foot long. Calyx. 5 in.; teeth lanceolate. Corolla. 7.8 in. long, golden-yellow. Pod 1-2 by .7.8 in., smooth; seeds kidney-shaped, many, imbricating in two rows, on long funicles.

Common in fallow lands and forest-glades in the Dun and in the Saharanpur Stwaliks; Doiwala, Phandowala, Karwapani, Dholkhand, etc.

The stem yields a fairly strong fibre.

F. & Fr. Nov.-Mar.

2. C. tetragona, Roxb.; Fl. Br. Ind. ii. 78 Gamble Man. Ind. Timb. 230.

A stiff shrub, 4.6 ft. high; branches quadrangular, silky. Leaves 6.12 by .5.1.5 in., linear or lanceolate, acuminate, membranous, thinly silky or glabrescent; stipules usually 0. Racemes 6.8 in. long, few-flowered. Flowers 1-1.5 in. long. Calyx .7-1 in. long, brown-velvety. Corolla yellow, very slightly exserted. Pod 1.5.2 in. long, densely dark-brown-velvety, 12-20-seeded.

Ráu-beds in the Saháranpur Siwaliks; Timli Pass. Also in the Dún; Nakraunda, Lachiwála, etc.

Fl. Sept.-Nov. Fr. Mar.-June.

The cultivated Sann or Sun, C. juncea, Linn.; Fl. Br. Ind. ii. 79, closely resembles the last species, but has smaller leaves, and pods elothed with persistent silky hairs. It yields the sun fibre. Many other species occur in our region, but they are mostly herbaceous or inconspicuous.

3. Indigofera, Linn.; G. P. n. 91.

Herbs or shrubs clothed with adpressed white hairs. Leaves usually imparipinnate; leaflets entire. Inflorescence a copious axillary raceme. Calyx small, campanulate, 5-toothed. Standard ovate; keel at first held in a bent position by spurs on either side which catch on the wings, but straightens afterwards with a

sudden jerk—a contrivance in nature for the dissemination of pollen. Stamens diadelphous; anthers apiculate. Ovary sessile, many-ovuled; style glabrous, stigma capitate. Pod usually linear-cylindrical and straight.

Analysis of the Species.

Branchlets white-canescent; bracts minute; (leaves subcoriaceous). Branchlet; glabrescent; bracts exceeding the buds.

Leaves memb anous.

Stipels miru'e; corolla dark-purple . 2. I. atropurpurea. Stipels sistinct; corolla crimson-red . 3. I. hebepetala. Leaves su coriaceous; (corolla rose-coloured) 4. I. pulchella.

1. I. heterantha, Wall.; Brandis For. Flora 135, Ind. Trees 218; Gamble Man. Ind. Timb. 230. Syn.—I. Gerardiana, Wall., var. heterantha; Fl. Br. Ind. ii. 100. Vern. Káthi, Káthoi, Jaunsar; Sákiná. Garhwal.

A shrub with brown bark; branchlets white-canescent. Leaves 1.5.2.5 in. long, short-petioled. Leaflets 17.31, opposite, .3.5 in. long, obovate, mucronate, subcorisceous, pale-grey beneath, clothed with short white hairs above; stipels and bracts minute. Racemes 1.2.5 in. long, peduncled. Flowers about .5 in. long. Calyx campanulate, hairy outside. Corolla .2.4 in. long, red. Pod 1.1.5 in. long, spreading, cylindrical, glabrous.

JAUNSAR and TEHRI-GARHWAL, 3,-8,500 ft., from Saiá all the way to Deotá, Lembátách, etc.

The twigs are used for basket-work. The shrub is gregarious and has some value as fuel near hill-stations like Chakrata.

- Fl. May, June. Fr. Sept.-Nov.
- I. Gerardiana, Wall., or the type of this species according to the Fl. Br. Ind., is a smaller plant with fewer leaflets, but larger pod. It is less common; Koti-Kanásar, Deotá, etc.
- 2. I. atropurpurea, Hamilt.; Fl. Br. Ind. ii. 101. Brandis For. Flora 136; Ind. Trees 217; Gamble Man. Ind. Timb. 230. Vern. Káthi, Káthoi, Dande-ká Kátha, Jaunsar; Kálá Sákiná, Garhwal.

A tall shrub; branchlets glabrescent. Leaves imparipinnate, 4-8 in. long; petiole 1-3 in. long. Leaflets 5-13, opposite, '8-2 by '6-1 in., ovate obovate or elliptic, membranous, glabrescent, dark-green; stipels minute. Racemes 4-6 in. long; peduncle 1-2 in.; bracts tanceolate, exceeding the buds. Flowers '3-'4 in. long. Calyx about '1 in. long, obliquely campanulate, with scattered white hairs outside. Corolla deep-pink or dark-purple. Pod linear, turgid, glabrous, not narrowed into a beak.

JAUNSAR and TEHRI-GARHWAL, up to 8-500 ft.; Deoban Munchili, Kat ian, etc.

Economic use as of the foregoing species.

Fl. Mar.-June, according to elevation.

3. I. hebepetala, Benth.; Fl. Br. Ind. ii. 101; Brandis Ind. Trees 217; Gamble Man. Ind. Timb. 231.

A tall shrub; branchlets glabrescent. Leaves imparipinnate, 4-6 in. long. Leaflets 13-17, opposite, usually 1-1.5 in. long, ovate, obtuse, membranous, dull-green above, pale beneath; stipels distinct. Racemes 2-4 in. long, few-flowered, peduncled; bracts boatshaped, bristly at the tip, exceeding the buds. Calyx: 1 in. long, obliquely campanulate. Corolla: 5 in. long, deep-red. Pod glabrous, 1.5-2 in. long, 8-10-seeded.

Jaunsar, 7,-10,000 ft., generally in shady places: Jhálkúri, Koráin, etc.

The stems and branches are used for fuel.

Fl. May, June.

4. I. pulchella, Roxb.; Fl. Br. Ind. ii. 101; Brandis For. Flora 126, Ind. Trees 217; Gamble Man. Ind. Timb. 231. Vern. Nil, Hind.; Akina, Dún and Garhwal.

A shrub 10-12 ft. high; branchlets glabreseent. Leaves imparipinnate, 3-6 in. long. Leaflets 13-21, opposite, 6-8 by 3-4 in., obovate-oblong, subcoriaceous, pale-green above, glaucous beneath, with adpressed grey hairs on both surfaces; stipels minute or 0. Raeemes 1-4 in. long, moderately compact, short-peduncled; bracts boat-skaped, exceeding the buds. Calyx about 1 in. long, white-canescent; teeth short. Corolla about 8 in. long, bright-red or rose-coloured; standard reflexed. Pod 1.2-1.7 in. long, straight, turgids glabrous, 8-12 seeded; sutures broad.

Sál forests of the Dún and the Siwaliks, and the Hills up to 9,000 ft., very common in some localities, e.g., Karwápáni; Konáin, Mundáli, etc.

The branches are often used for fences, and also for fuel.

Fl. Nov.-Mar., according to elevation. Fr. Rainy season.

- I. hirsuta, Linn.; Fl. Br. Ind. ii. 98; —is a short subcrect herbaceous plant with stems densely clothed with brown pubescence. Racemes 2.4 in. long, very dense. Flowers red. Pod '7-1 in. long, densely put escent. Found in grass-lands and rau-beds in the Siwalik Tracrs. Phandowala, Ranipur, etc.
- I. Dosua, Ham.; Fl. Br. Ind. ii. 102; Brandis Ind. Trees 218—is a low shrub densely pubescent like the above. Flowers bright-red. Pod about 1 in. long, glabrescent. Common in grasslands and fire-traces in the Hills: Lokhár, Ringáli, Bháshlá, etc.

4. Millettia, W. & A.; G. P. n. 104.

1. M. auriculata, Baker; Fl. Br. Ind. ii. 108; Brandis For. Flora 138; Ind. Trees 219; Gamble Man. Ind. Timb. 232. Vern. Gauj, Hind.

A large woody gregarious climber. Leaves 1-2 ft. long. crowded at the ends of the branches; petiole with a swollen base. Leaflets 7-9, lateral opposite, 3-8 by 2-5 in., obovate elliptic or oblong, abruptly acuminate, entire, subcoriaceous, densely grey-silky when young, afterwards glabrescent above, pale beneath; stipels minute. Racemes 4-10 in. long, axillary; rachis downy. Flowers 3-4 in. long, dull-white, fascicled on the rachis. Calyx about 1 in. long, shortly toothed, densely silky. Corolla 3-4 in. long, silky all over; standard auriculate above the claw (whence the specific name); wings falcate; keel-petals incurved. Stamens monadelphous (though generally diadelphous in the Genus). Style filiform, incurved, glabrous; stigma capitate. Pod 4-7 by 1-15 in., hard, brownvelvety, with very thick sutures.

Extremely common and a pest in the Dun and Samarapur Forests; also found in the Tons Valley and elsewhere in Jaunsar and Tehri-Garhwal, up to 3,000 ft.

The branches when beaten give a coarse fibre which is used for rough cordage. They are also made into brushes for daubing trees with paint. The leaves and twigs are lopped for eattle-fodder and eaten by elephants.

Fl. May, June. Fr. Cold season.

5. Tephrosia, Pers. : G. P. n. 100.

1. T. candida, DC.; Fl. Br. Ind. ii. 111; Brandis For. Flora 138: Gamble Man. Ind. Timb. 234. Vern. Kulthi. Loshtia. Dún: Masethi. Málkot.

A low shrub; branches grooved, clothed with brown or grey velvety pubescence. Leaves imparipinnate, 5-9 in. long, shortpetioled; stipules setaceous. Leaflets 19-25, opposite, 2-3 by 3-7 in., narrow-elliptic, acute at both ends, entire, coriaceous, dark-green and glabrous above, pale and silky beneath; lateral nerves numerous. straight, very fine; midrib prominent. Racemes 6-9 in long, terminal and lateral, often fascicled; pedicels '3-5 in, long, silky. Calux campanulate, '15-'2 in. long, short-toothed, silky. Corolla '7-1 in. long, white with a shade of red; petals clawed; standard suborbicular, densely silky. Stamens diadelphous. Pod 3-4 by 3 in., 10-12 seeded, continuous, slightly recurved, clothed with adpressed brown silky hairs, generally tipped with the persistent style.

Common in some parts of the Dún, e.g., Chandrabani, Rám-

garh, Bindál-nálá, Bidhalna Block, etc.

Much planted as a fertiliser in tea-gardens in Assam. The leaves and bark are used to intoxicate fish.

Fl. Aug., Sept. Fr. Nov., Dec.

6. Sesbania, Pers.; G. P. n. 118.

1. S. ægyptiaca. Pers.; Fl. Br. Ind. ii. 114; Brandis For. Flora 137, Ind. Trees 219; Gamble Man. Ind. Timb. 235. Vern. Jaent. Hind.

A soft-wooded shrub 10-15 ft. high, of brief duration. Leaves paripinnate, 3-6 in. long. Leaflets 9-20 pairs, 6-1 by 1-2 in., linearoblong, minutely petioluled, membranous, glabrous, pale-green. Racemes 3-6 in. long, axillary, few-flowered; pedicels about '2 in. long. Flowers pale-yellow. Calyx campanulate, 2 in. long, shorttoothed, membranous, glabrous. Petals 5-7 in. long, yellow, often with purple spots. Stamens diadelphous. Pod 6-9 by 15 in., torulose, flexible, twisted, 20-30 seeded, septate between the seeds.

Cultivated throughout the plains of India for its very rapid

growth and shade-vielding capacity.

Wood white, extremely soft, weighing about 27 lbs, per c. ft. It is said to give the best gunpowder charcoal. The fibre of the bark is used for rope, and the leaves and tender branches for cattlefodder.

Fl. Aug., Sept. Fr. Dec. Feb.

7. Caragana, Lam.; G. P. n. 130.

1. C. brevispina, Royle; Fl. Br. Ind. ii. 116; Brandis For. Flora 133, Ind. Trees 216; Gamble Man. Ind. Timb. 236. Vern. Ari. Kathúr-kantá, Jaunsar.

An erect spinescent shrub, 6-8 ft. high; young branches finely downy. Leaves paripinnate, 2-4 in. long; rachis finally spinescent. Leaflets 8-16, variable, '3-6 by '2-5 in., obovate, pubsecent beneath, minutely petioluled. Racemes 2-3 in. long, unbellately 1-3-flowered; pedicels downy, bracteate. Calyx campanulate, placed very obliquely on the pedicel, '3-4 in. long, pubescent; teeth acute. Petals yellow, '6-1 in. long, all of nearly the same length; standard broad, reflexed, much thicker and firmer than the other petals. Stamens diadelphous. Style incurved, glabrous. Pod 2-3 in. long, straight, cylindrical, turgid, glabrous outside, woolly inside.

Jaunsar and Tehri-Garhwal, 6,-9,000 ft. Common at Konáin, Mundáli and Deotá.

Fl. Apr.-June. Fr. Aug.-Oct.

C. Gerardiana, Royle; Fl. Br. Ind. ii. 116; Brandis Ind. Trees 216—has also been found in Tehri-Garhwal, e.g., in the Jaurási and Morirú Blocks. It is a diffuse undershrub differing from the above in having smaller leaves and leaflets, subsessile flowers, and shorter pods which are hirsute outside.

Fl. May-Aug.

8. Lespedeza, Mich.; G. P. n. 182.

Herbs or undershrubs. Leaves pinnately 3-foliolate, without stipels. Flowers axillary, fascicled or racemed. Calyx-tube campanulate; teeth long. Corolla exserted; standard broad. Stamens diadelphous. Ovary sessile or stipitate, 1-ovuled; style long, incurved, often persistent; stigma minute. Pod 1-seeded, small, oblong, compressed, reticulate, indehiscent.

Analysis of the Species.

Keel obtuse, not much incurved; flowers fascicled in leaf-axils

Keel acute, much incurved; flowers racemed.
Pod about 1 in long, densely grey-silky.
Pod 2 in. long, clothed with adpressed hairs 3. L. eriocarpa.

 L. sericea, Miq.; Fl. Br. Ind. ii. 142. Vern. Khúnjú. Dún.

An erect undershrub, 2-4 ft. high, with long slender branches. Leaves ascending; petiole short. Leaflets '3-'6 by about '1 in., linear-cuneate, emarginate, minutely petioluled, rigidly coriaceous, usually glabrous above, adpressedly silky-hairy beneath. Flowers 2-4 together in the axils of the leaves; pedicels short; bracteoles minute. Calyx '1 in. long, canescent, teeth very long. Corolla about '2 in. long, white but tipped with purple. Pod '1 in. long, thinly silky; style '2 in. long, persistent.

Jaunsar and the Dún. Lachiwála, Rámgarh; Chakrata. Fl. May, June. Fr. Oct., Nov.

L. stenocarpa, Maxim.; Prain's Additional Leguminosæ in Journ. As. Soc. Beng. lxvi, Part II, No. 2, 376; Gamble Man. Ind. Timb. 236. Syn.—L. macrostyla, Baker (in part); Fl. Br. Ind. ii. 143.

An undershrub, 3.5 ft. high; branches densely white-pubescent. Petiole '5.7 in. long. Leaflets '5.8 by '4.6 in., obovate-cuneate, often emarginate, rigidly subcoriaceous, white-silky beneath. Racemes short, dense, silky; buds hidden by ovate silky braots; pedicels '1.2 in. long. Calyx '1 in.; teeth longer than the tube. Corolla '4.6 in. long, red. Pod about 1 in. long, shortly stalked, narrow-oblong, densely grey-silky, gradually tapering to the base of the persistent hairy style.

Common in the SIWALIK TRACT, on steep sandy hill-slopes and banks of raus. Mohand Pass, Dholkhand, Ranipur, etc. Also low elevations in the HILLS.

Fl. Aug., Sept. Fr. Dec.-Feb.

3. L. eriocarpa. DC.; Fl. Br. Ind. ii. 144; Gamble Man. Ind. Timt. 236.

A much-branched erect shrub, 3-4 ft. high; branchlets slender, angular, furrowed, silky. Petiole (except in var. Falconeri, Prain) longer than in the other two specie; sometimes up to 1.5 in.; stipules setaceous. 2-3 in. long. Leaflets 3-1 in. long, obovate cuneate, adpressedly silky-hairy beneath. Racemes 2-3 in. long, rather lax, peduncled; bracts not exceeding the buds; pedicels 15-2 in. Calyx 15 in. long; teeth much longer than the tube. Corolla 4-5 in. long, bright-pink. Pod 2-3 in. long, coriaceous; style as long as the pod, subsecent near the base.

Fairly common in Jaunsar and Tehri-Garhwal, 4,-8,000 ft. Lurli, Missau, Kathian, Tons Valley, etc.

Fl. May-Sept. Fr. Cold season.

9. Ougeinia, Benth.; G. P. n. 169.

1. **O. dalbergioides,** Benth.; Fl. Br. Ind. ii. 161. Brandis For. Flora 146, Ind. Trees 224; Gamble Man. Ind. Timb. 237. Vern. Sándan, Hind.

A middle-sized tree with a thin ashy-grey or light-brown bark which exudes beads of red gum when cut. Leaves pinnately 3-foliolate, stipellate; rachis 3-6 in. long, channelled above. Lateral leastlets opposite, 2·5-4·5 by 1·5-3 in., obliquely elliptical; terminal 3-6 by 2-3·5 in., broad-ovate; all entire or obscurely crenate, coriaceous, glabrous above, more or less downy or glabrescent beneath; lateral nerves about 6 pairs; petiolules·1·2 in. long. Flowers light-pink or white, in fascicled racemes generally from the old wood; pedicels·5·8 in. long, very slender, clustered on short branches of the raceme; bracts small, scaly. Calyx·1·15 in. long, pubescent; teeth obtuse. Corolla·3·4 in. long; standard nearly orbicular, shortly clawed; keel obtuse. Pod very distinctly jointed, 2-4 by '3 in., flat; joints·6·8 in. long. Seeds about '2 in. long, smooth, brown when mature.

A common tree in Sál forests in the Dún and Saháranpur Siwaliks and in the Outer Himalaya; also found in the chir forests of Jaunsar and Tehri-Garhwal, up to 4,000 ft., e.g., Khunigádh, Moltá, etc.

Heartwood pale or deep reddish-brown, hard, close-grained, strong, tough and durable, and takes a beautiful polish; weight 55-65 lbs. per c. ft. It is much used for agricultural implements, furniture, building, and the like. The bark yields an astringent red gum, and is pounded and used to intoxicate fish. The twigs are lopped for cattle-fodder. The tree can be most easily propagated by root-suckers.

Leafless Feb., Mar. Fl. Mar., Apr. Fr. May, June.

10. Desmodium, Desv.; G. P. n. 170.

Shrubs or herbs. Leaves pinnately 3-foliolate or 1-foliolate, stipellate. Flowers small, red or whitish, in axillary and terminal simple or panicled racemes, rarely umbelled. Calyx campanulate or turbinate. Corolla exserted; standard broad; wings more or less attached to the keel, which is usually obtuse. Stamens diadelphous, sometimes the upper stamen only partially free.

Style incurved; stigma minute, capitate. Pod compressed, usually with articulate joints; joints 1-seeded, generally indehiscent, rarely splitting open in a continuous line along the ventral suture.

Anaylsis of the Species.

0 , 1	
Flowers umbelled; leaves 3-foliolate. Umbels axillary, naked	1 D Combalotes
	1. D. Cephaloles.
Umbels arranged in plicate racemes, hidden	
by a pair of persistent foliaceous bracts.	2. D. pulchellum.
Flowers in axillary and terminal, simple or	-
panicled racemes.	
Pod distinctly jointed and articulate;	
joints generally indehiscent.	
Leaves 1-foliolate.	
Petiole winged	4. D. triquetrum.
	6. D. latifolium.
Leaves 3-foliolate.	•
Leaflets dark-green, narrow; pod beset	
with hooked hairs	3. D. laburnifolium
Leaflets pale-green, broad; pod thinly	
silky-hairy	
Pod indistinctly jointed and not articulate,	•
dehiscing in a continuous line along the	
ventral suture; (leaves normally	
	7. D. gyrans.
D-101101000/	i. D. ygrano.

1. **D. Cephalotes,** Wall.: Fl. Br. Ind. ii. 161; Gamble Man. Ind. Timb. 238; Brandis Ind. Trees 222; Vern. Bhattá, Garhwal.

A shrub 4-6 ft. high, with grey bark; branches triquetrous. Leaves 3-foliolate; petiole 1-2 in. long, deeply furrowed, grey-downy. Leaflets 3.5-6 by 1.5-2.5 in., oblong or elliptic, subcornaceous, grey-silky beneath; lateral nerves and midrib prominent and brightly silky beneath, the former 10-16 pairs. Flowers about 3 in. long, 20 or more in dense axillary umbels; pedicels silvery, jointed at the apex. Calyx:15 in. long; teeth lanceolate. Corolla red, 25 in. long. Pod about 1 in. long, 4-5-jointed, indented more or less along both sutures, densely grey-silky.

Common in the Sal forests of the Dun, especially at Lachi-wala and Thano.

The pods are said to be poisonous for cattle.

Fl. July, Aug. Fr. Nov., Dec.

2. D. pulchellum, Benth.; Fl. Br. Ind. ii. 162; Brandis For. Flora 145, Ind. Trees 223; Gamble Man. Ind. Timb. 239. Vern. Thá pi. Garh val; Jatá Eálpán, Hind.

An erect shrub, 4-6 ft. high; branches ribbe 1, grey-downy. Leaves 3-foliolate; petiole 3-5 in. long. Lateral leaflets 1-5-2-5 by 6-1 in., -5-8 in. below the terminal which is 25-4 by 1-2-1-5 in., both elliptic or oblong-lanceolate, generally acute, rounded at the base, pubescent beneath; lateral nerves 8 pairs. Flowers 2-3 in. long, in 2-6-flowered umbels, each umbel subtended by a pair of persistent orbicular foliscoous bracts about 5 in. diam., the umbels themselves in axillary and terminal plicate race nes, 4-10 in. long. Calyx-1 in. long; teeth shorter than the tube. Corolla 25 in., white with a shade of red. Pod 25 in. long, generally with 2 joints, constricted at both sutures.

Common in the Dún in the same localities as the preceding species.

Fl. July-Sept. Fr. Cold season.

3. D. laburnifolium, DC.; Fl. Br. Ind. ii. 163.

A shrub 6-8 ft. high; branches few, slender, glabrescent; bark dark-grey. Leaves 3-foliolate; petiole 1-1-5 in., thickened, grooved; stipules free, minute. Leaftets 2-4 by 1-1-5 in., oblong-lanceolate, acute at both ends, dark-green, glabrous and shining above, hairy on the nerves beneath. Racemes about 6 in. long; pedicels 2-3 in. Flowers whitish, 3-4 in. long. Calyx about a third of the flower, hairy; teeth narrow, as long as the tube. Corilla 2-3 in. Pod 2-4 in. by 3 in., beset with short hooked hairs; joints 6-8, rectangular, twice as long as broad, easily breaking off.

In damp shady localities in the Dun, such as Motl ronwala, Nakraunda, Jōgiwala, Khairi, Robbers' Cave, etc.

The leaves are eaten by buffaloes.

Fl. July, Aug. Fr. Dec., Jan.

4. D. triquetrum, DC.; Fl. Br. Ind. ii. 163; Brandis For. Flora 146, Ind. Trees 224.

A sub-procumbent shrub, 3-4 ft. long; branches triquetrous, glabrescent. Leaves 1-foliolate. Leaflet 3-6 by 1·2·2·2 in., oblong, lanceolate, acute, subcoriaceous, scaberulous above, hairy on the nerves beneath; petiole '7·1·3 in. long, winged to an oblanceolate shape, '2·4 in. broad; main lateral nerves 12-15 pairs. Racemes 6·12 in. long, axillary and terminal; pedicels '1·2 in. Calyx about

'l in., campanulate. Pod 1-2 by '2 in., 6-8-jointed, glabrous or pubescent, indented between the joints at the ventral suture.

Common about Lachiwála on forest-paths, in grass-lands, and along the banks of the Ré-nadi in the Dún.

Fl. July, Aug. Fr. Sept.-Dec.

5. **D. tiliæfolium,** D. Don; Fl. Br. Ind. ii. 168; Brandis For. Flora 145, Ind. Trees 223; Gamble Man. Ind. Timb. 239. Vern. *Mártoi. Mátoi.* Jaunsar.

A somewhat diffuse shrub, 4-10 ft. high; branchlets pubescent. Leaves 3-foliolate; rachis 1.5-3.5 in. long, pubescent. Leafets 1.3 by '7-2.2 in., broad-ovate or rhomboid, often mucronate at the apex, subcoriaceous, glabrescent above, silky-pubescent beneath, margins entire or wavy; main lateral nerves about 6 pairs, the lowest pair from near the base. Flowers red, in terminal panicles and axillary racemes; pedicels '3-'4 in. long, filiform, finely downy. Calyx '1 in., downy; teeth shorter than the tube. Corolla '3-'5 in. long. Pod 2-3 by '25 in., slightly falcate, compressed, indented between the joints at the inner edge, thinly silky-hairy; joints 6-9, longer than broad.

Common and somewhat gregarious in JAUNSAR and TEHRI-GARHWAL, between 4,000 and 8,500 ft.

The thin grey bark is used for rope and paper-making. The twigs are browsed by cattle, and the branches are cut up into faggots and used for fuel in Chakrata.

Fl. June, July. Fr. Oct., Nov.

6. D. latifolium, DC.; Fl. Br. Ind. ii. 168; Brandis For. Flora 145, Ind. Trees 224.

An erect undershrub, 4-6 ft. high. Leaves 1-foliolate. Leaflet 2-5 by 1.5-3.5 in.. broad-ovate, truncate or cordate and 3-nerved at the base, hispid above, densely soft-pubescent beneath; tip rounded or acute, mucronate; lateral nerves 7-8 pairs including the basal; petiole 4-7 in. long; stipules semicordate, cuspidate. Flowers 2 in. long, bright-purple, clustered on axillary and terminal racemes which are 4-8 in. long. Calyx minute; teeth linear. Pod 6-1 by about 1 in., 4-6-jointed, much constricted between the joints, densely clothed with minute hooked hairs; joints 4-6, rather longer than broad, readily separating.

The Dun and the Outer Himalaya, up to 3,500 ft.

Fl. Aug., Sept. Fr. Nov., Dec.

7. **D. gyrans**, DC.; Fl. Br. Ind. ii. 174; Brandis For. Flora 146; Gamble Man. Ind. Timb. 238. The Telegraph plant. Vern. Khúni. Garhwal.

An erect shrub, 4-8 ft. high, with glabrous green branches. Leaves normally 3-foliolate, but often 1-foliolate by the abortion or early fall of the small lateral leaflets; petiole 1-1-5 in. Terminal leaflet 3-4 by 1-1-7 in., oblong-lanceolate, quite entire, rather membranous, glaucous beneath, often with irregular-shaped glaucous blotches above; main lateral nerves about 10 pairs. Lateral leaflets absent or rudimentary, '5-'7 by '1-'12 in., rotating by jerks. Flowers '5 in. long, in axillary racemes and terminal panicles, at first hidden by large ovate bracts; pedicels '25 in. long, downy. Calyx '1 in. long, campanulate; teeth short. Corolla '2-'3 in. long. Pod '1-1-15 by '2 in., falcate, 6-10-jointed, not articulate, slightly indented along the lower, and dehiscing in a continuous line along the upper, suture.

Common in the Dún and in Chir forests along the Tons ${f Valley},$ usually with grass.

Fl. Aug., Sept. Fr. Nov.-Jan.

Two forms of this plant are noticeable;—one scarcely exceeding 4 ft. in height, with narrow-lanceolate, somewhat coriaceous terminal leaflet, petiole less than 1 in. long, and scaberulous pods,—and the other about twice as tall, with broader oblong-elliptic rather membranous terminal leaflet, much longer petiole, and glabrous or glabrescent pods. Is the latter var. Roylei, W. & A.?

This large Genus comprises several other shrubs and undershrubs occurring in the region of this Flora, of which the following deserve brief notice:—

- 1. D. laxiflorum, DC.; Fl. Br. Ind. ii. 164; Brandis Ind. Trees 223. A weak subcreet plant with 3-foliolate leaves. Leaflets 3-6 in. long, elliptic, membranous. Racemes 8-15 in. long, slender, drooping. Pod 15-2 by '08 in., somewhat constricted and easily breaking off between the joints, catching on clothes by hooked hairs. Common in the Dén. Fl. Aug., Sept. Fr. Nov., Dec.
- 2. D. sambuense, DC.; Prain's Additional Leguminosse in Journ. As. Soc. Beng., 1xvi, Part ii., No. 2, 394; Brandis Ind. Trees 223. Syn.—D. foribundum, G. Don.; Fl. Br. Ind. ii. 167. Vern. Gor Mártoi, Jaunsar. Stem angular. Leaves 3-foliolate. Leaflets 1·5-2 by 1-1·5 in., rhomboid or elliptic; common petiole 2-3 in.; stipules prominent. Racemes 3-6 in. long. Flowers 5 in. long.

- Pod '7-1 by '1 in., 6-8-jointed. JAUNSAR about Chakrata, Dhármigádh, etc.; also Sainjni, Kúlni, etc., in TEHRI-GARHWAL.
- 3. D gangeticum, DC.; Fl. Br. Ind. ii. 168; Brandis Ind. Trees 224. Stem 2-3 ft. high. Leaves 1-foliolate; petiole '7-1'2 in. Leaflet 2-4 in. long, variable in width, ovate to narrow-lanceolate, membranous. Racemes 6-12 in. long, mostly terminal; pedicels ascending. Flowers about '2 in. long. Pod '5-'7 by '1 in., 6-8-jointed, common in blanks in Sál forests in the Dún. Fl. July, Aug. Fr. Cold season.
- D. concinnum, DC.; Fl. Br. Ind. ii. 170; Brandis Ind. Trees
 A tall undershrub with slender drooping branches. Leaves
 3-foliolate; petiole '5-1 in. Leaflets oblong, obtuse, 1'5-3 in. long, lateral ones smaller. Racemes terminal and lateral, 6-12 in. long; bracts conspicuous. Flowers '2-'3 in. long. Pod 1 by '12 in., 4-6-jointed. Robbers' Cave near Dehra Dún.
- 5. D. parvifolium, Baker; Fl. Br. Ind. ii. 172. A diffuse undershrub with 1-3-foliolate leaves. Leaflets very variable in size, '2-1'5 in. long, oblong, subcordate, membranous. Flowers '15 in. long; corolla included in the calyx. Pod about '5 in. long, falcate, 4-6-jointed. Rámgarh and Karwápáni in the Dún. Fl. Aug., Sept. Fr. Nov., Dec.

D. Padreerburn.

11. Abrus, Linn.; G. P. n. 188.

- 1. A. precatorius, Linn.; Fl. Br. Ind. ii. 175; Brandis For. Flora 139, Ind. Trees 225; Gamble Man. Ind. Timb. 240. Vern. Chúntli, Ratgiri, Dún; Gúnjá, Gúnchi, Hind.
- A much-branched climber with a woody stem. Leaves paripinnate, 2-3 in. long. Leaflets 20-40, opposite, deciduous, '4-1 by '2-'3 in., oblong-ligulate, membranous, glabrous or thinly silky beneath. Flowers reddish or white, in dense pedunculate racemes which are shorter than, or as long as, the leaves; peduncles often leaf-bearing. Calyx '1-'15 in. long, campanulate, truncate, thinly silky. Corolla '3-'5 in. long; standard ovate, acute; wings narrow; keel larger than the wings, arcuate. Stamens 9, united in a sheath which is slit above; the tenth absent. Ovary many-ovuled; style short, incurved, not bearded; stigma capitate. Pod 1-1'7 by '4-'5 in., oblong, turgid, 3-5-seeded. Seeds about '2 in. long, ovoid or subglobose, generally two-thirds scarlet or white and the rest jet-black, with a large white hilum in the black part, sometimes wholly black or white, smooth, shining.

Very common along the foot of the Saháranpur Siwaliks, especially near Khárá, Ránipur and Kasúmri; also on hedges in the Dún. Amláwa Valley, Jaunsar.

The seeds are recognized by Indian jewellers as the minimum unit of weight, and are used for weighing gold and precious stones. The root resembles liquorice in medicinal property.

Fl. Aug., Sept. Fr. Cold season.

A. pulchellus, Wall., Fl. Br. Ind. ii. 175—differs from the above in having larger leaflets, racemes exceeding the leaves, larger but thinner-valved pod and greyish-brown compressed seeds. Found in the Dún (Lachiwála, Tháno, Ráipur, etc.) and the OUTER HIMALAYA. Fl. Aug., Sept.

12. Mucuna, Adans.; G. P. n. 205.

Climbers, generally herbaceous. Leaves large, pinnately 3-foliolate, stipellate. Flowers large, usually dark-purple, in few-flowered racemes or corymbs. Calyx campanulate, the two upper teeth connate. Corolla much exserted; keel rostrate, much exceeding the standard and usually slightly exceeding the wings. Stamens 2-adelphous; anthers alternately versatile and basifixed. Ovary sessile, many-ovuled; style incurved, beardless; stigma capitate. Pod hard, usually covered with irritating bristles.

Analysis of the Species.

Leaves glabrous; pod obliquely plaited on the faces 1. M. atropurpurea.

Leaves silky beneath; pod not plaited on the faces 2. M. pruriens.

1. M. atropurpurea, DC.; Fl. Br. Ind. ii. 186; Brandis Ind. Trees 226; Gamble Man. Ind. Timb. 240. Vern. Bhainswalibel, Dún.

A climber with soft porous wood. Leaflets 5-8 by 3.5-5 in., ovate or elliptic. 3-5-nerved at the base, membranous, shining above, lateral very oblique, the end one cuspidate; rachis 5-8 in. long.

Racemes 6-12 in. long, long-peduncled, drooping, 12 30 flowered, often forked; bracts small, deciduous; bracteoles 2-3 in. long. Calyx 5-6 in. long, 2-lipped, grey-pubescent and also with scattered irritating brown bristles. Corolla 2-25 in. long, dark-purple; standard about half the length of the keel; wings about half the length of the standard. Pod 3-4 by 1-1-3 in., with close oblique plaits on the faces, covered with brownish-yellow irritating bristles.

Found in the Dún about Dehra, and also in the Dhármigádh valley, Jaunsar. Not common.

Fl. Aug., Sept. Fr. Cold season.

2. M. pruriens, Dt.; Fl. Br. Ind. ii. 187; Gamble Man. Ind. Timb. 240; Brandis Ind. Trees 226. The Cowitch or Cowhage plant. Vern. Káunch, Gáunch, Dún.

An annual twining herk Leaflets 3-8 in. long, ovate or rhomboid, membranous, glabrescent above, adpressedly silky pubescent beneath, mucronate; rachis 6-10 in. long. Racemes 4-8 in. long, short-peduncled, drooping, 0-20-flowered. Calyx 25-4 in. long, 2-lipped, with a few irritating ristles. Corolla 1-3-1-6 in. long, purplish. Pod 2-3 by 6-18 in., 5-6-eeded, turgid, turned up at the end, longitudinally ribbed, covered with dense pale-brown bristles.

On hedges in the outskirts of villages and in abandoned village sites in Saháranpur and the Lin. Fairly common.

The seeds and roots are used in nedicine and the irritating hairs as a vermifuge.

Fl. Feb., Mar.

M. capitata, W. & A., Fl. Br. Ind. ii 187,—is closely allied to the last species, but the flowers are corymose, and the pod about twice as long and covered with deciduous ristles. Found in the Saháranpur Siwaliks.

Fl. Rainy season. Fr. Cold season.

M. imbricata, DC., Fl. Br. Ind. ii. 185 Brandis Ind. Trees 225, resembles M. atropurpurea, but the pod, bides being plaited is broadly winged at both sutures. It is found the Don. $(M\tau. J. F. Duthie.)$

13. Erythrina, Linn.; G. P. n. 01.

1. **E. suberosa**, Roxb.; Fl. Br. Ind. ii. 186 Brandis For. Flora 140, Ind. Trees 227; Gamble Man. Ind. Tim 241. Vern. Dhaul Dhák, Madár, Hind.

A moderate-sized deciduous tree; outer bark corky, light-grey, 1-2 in. thick, with deep irregular vertical cracks; branches armed with straight whitish conical prickles; young parts, leaves beneath and inflorescence usually covered with soft tomentum. Leaves

with cottony down beneather the property of the branches. Flowers bright carlet, 1.5-2 in. long, in fascicles of 2-3; pedicels '3-5 in. long. / Calyx campanulate, obsoletely 2-lipped in flower. Corolla much exserted, straight; standard 1.5-2 in. long, '5-7 in. broad, narrowd into a short claw; wings '2-3 in. long, falcate; keel-petals '6-7 in. long, connate. Stamens 2-adelphous; upper stamen free nearly to the base. Ovary stipitate, many-ovuled; style incurved, begedless; stigma capitate. Pod stipitate, 3-4 by '3-4 in., tapering aboth ends, torulose, 4-6-seeded; seeds black.

Var. glabrescens, Prain, John. As. Soc. Beng. lxvi, Part ii. No. 2. 410—differs from the typen that the leaflets are glabrescent beneath at an early age, afterwards glaucous.

The type is occasionally et with along raus in the Siwaliks, but the above variety is compon in the Sal forests of the Siwalik Division, and also in the Toyland Jumna Valleys in Jaunsar and Tehri-Garhwal, up to 4.00ft.

Wood soft, white, spagy, but fibrous and tough, very light, weighing 13-20 lbs. per c. if It is used for scabbards, ladles, sieve-frames, and butter and ghé-pots. The tree is easily propagated by cuttings.

Leafless Jan., Feb/ Fl. Mar., Apr. Fr. June.

14. Spathcobus, Hassk.; G. P. n. 208.

1. S. Roxb'rghii, Benth.; Fl. Br. Ind. ii. 193; Brandis For. Flora 143, In Trees 229; Gamble Man. Ind. Timb. 243, Vern. Maulá or Mpá-bel, Dún.

A large sintrorse climber; branches grey-pubescent; stem with concentric lers of bast inside, which exude a red gum when cut. Leaves pitately 3-foliciate, stipellate; rachis 3-4 in. long. Leaflets 4-9 by \$\frac{p}{2}\$ in., ovate or elliptic, acuminate, subcoriaceous, pubescent benefit, the lateral oblique; lateral nerves 6-8 pairs, irregularly brothed; peticlules 1-3 in. long. Flowers 3-4 in. long, white reddish, in fascicles of 3 on large terminal panicles which are ogn 2-3 ft. long; pedicles very short. Calyx campanu-

late, grey-velvety, half the length of the flower; teeth acute, the two upper connate. Standard emarginate, longer than the keel, which is obtuse and nearly straight; wings free. Stamens diadelphous. Ovary shortly stipitate, 2-ovuled; style incurved, beardless; stigma capitate. Pod 3-5.5 by 1-1.3 in., suddenly narrowed into a stalk '4-'6 in. long, softly brown-velvety, with only one seed near the end, dehisoing from the apex only down to the seed.

Common in the Sál forests of the SIWALIK DIVISION, especially in the Siwalik Range, where it does considerable harm to all trees by bending and distorting their stems, round which it twines with a very tight grip. In this respect it is the worst of all harmful climbers.

Wood soft and porous, but burns slowly and keeps on fire for a long time, for which purpose it is often used by people living near forests.

Fl. Sept.-Dec. Fr. Feb.-Apr.

15. Butea, Roxb.; G. P. n. 207.

1. **B. frondosa**, Roxb.; Fl. Br. Ind. ii. 194; Brandis For. Flora 142, Ind. Trees 230; Gamble Man. Ind. Timb. 243. Vern. *Dhák*, *Palás*, Hind.

A moderate-sized deciduous tree: bark fibrous, bluish-grey or light-brown outside, exuding a red juice when cut. Leaves punnately 3-foliolate, stipellate; rachis 5-9 in. long; stipules and stipels tomentose, deciduous. Leaflets hard, rigidly coriaceous, glabrescent above, silky-tomentose beneath: lateral leaflets 6-8 by 5-7.5 in... obliquely ovate or broad elliptic; petiolules 3-4 in. long, stout; terminal 5-8 by 4.5-7 in., rhomboid or broadly obovate from a cuneate base; lateral nerves 4-6 pairs, prominent. Flowers 2-3.5 in. long, fasoicled on rigid axillary and terminal racemes which are 4-7 in. long: inflorescence bracts and calvx dark brown-velvety. Calvx 5 in. long, fleshy, grey-silky inside. Petals bright orange-red, equal, silvery-tomentose outside; standard I in. broad, recurved; keel incurved, beaked; wings falcate, adhering to the keel. Stamens 2-adelphous. Ovary shortly stalked, 2-ovuled; style filiform, curved, not bearded; stigma capitate. Pod 4-6 by 1.5-2 in., ligulate, firm. pendulous, silky-tomentose, abruptly narrowed to a stalk 5-7 in. long, with only one seed near the apex, indehiscent below the seed.

Common in the Dún and Saháranpur Forests in blanks and open places, especially on water-logged soils as at Pathri. It is the most common indigenous tree of the Upper Gangetto Plain.

Wood dirty-white, porous, soft; annual rings indistinct; weight about 36 lbs. per c. ft. It is durable under water, and is used for well-curbs and piles. The bark of the roots yields a coarse brown fibre used for rough cordage and for caulking boats on the Ganges. The red juice exuded by the bark hardens into beads of ruby-coloured gum similar to kino, and is used as a substitute for it. The flowers give an orange dye, and a decoction of them is used to keep out white-ants from fields. The seeds have a medicinal use. Lac is often collected on the branches. The leaves are used as plates and to wrap up parcels, and are also lopped for buffalo-fodder.

Leafless in March. New leaves and fl. Apr., May. Fr. June, July.

16. Pueraria, DC.; G. P. n. 218.

1. **P. tuberosa,** DC.; Fl. Br. Ind. ii. 197; Brandis For. Flora 141, Ind. Trées 228; Gamble Man. Ind. Timb. 245. Vern. Surál, Sirál, Sarúr, Dún and Saháranpur.

A twining shrub with stringy grey bark; young branches grey-pubescent; stem porous, producing large globose underground tubers which are often of immense size, - whence the specific name. Leaves pinnately 3-foliolate, stipellate; rachis 5-8 in. long. Leaflets 4-6 by 3-4 in., broad-ovate, acuminate, silky-pubescent when young, glabrescent above and thinly pubescent beneath when mature, the lateral oblique; main lateral nerves 6-8 pairs including the stronger basal pair; base truncate or subacute, 3-5-nerved; lateral petiolules 2.3 in. long. Flowers bright blue, in simple or panicle 1 terminal racemes, 6-12 in. long; bracts minute. Calyx about 2 in. long, densely silky; teeth shorter than the tube. Corolla about 4 in. long; standard spurred at the base; wings oblong-falcate; keel obtuse, nearly straight. Stamens usually monadelphous. Ovary sessile, many-ovuled; style filiform, much incurved, beardless; stigma capitate. Pod 2-3 in. long, flat, flexible, 3-6-seeded, contracted between the joints, clothed with long bristle-like brown hairs.

Remarkably common about Kálsi; also found throughout the Dún and Sankranpur Forests, especially on Zizyphus Jujuba near Sháhjahánpur.

The large tubers which are sometimes up to 18 in. in 'ength and 12 in. in diameter, have a liquorice taste, and are eaten and used in medicine.

Leafless Nov.-May. Fl. Mar., Apr. Fr. Nov., Dec.

17. Rhynchosia, Lour.; G. P. n. 233.

1. **R. pseudo-cajan**, Camb.; Fl. Br. Ind. ii. 223; Brandis Ind. Trees 707; Gamble Man. Ind. Timb. 264.

An erect shrub, 4-6 ft. high; branches longitudinally ribbed; grey-tomentose. Leaves pinnately 3-foliolate, gland-dotted beneath; rachis ·5-1 in.; stipules minute. Leaflets ·5-2 by ·3-1·5 in., ovate to rhomboid, very softly woolly-tomentose and reticulate beneath, strongly 3-nerved at the base; stipels 0. Flowers in short-peduncled compact corymbs; pedicels short. Calyx ·2 in. long; teeth narrow-acuminate, densely woolly. Corolla ·4-·6 in. long, pale-yellow; keel incurved. Stamens 2-adelphous. Ovary subsessile, usually 2-ovuled; style long, much incurved; stigma capitate. Pod 1 by ·4 in. oblong, straight, slightly compressed, 1-2-seeded, persistently grey woolly.

Fairly common in fire-traces and grass-lands in the Tons Valley and elsewhere in JAUNSAR and TEHRI-GARHWAL, up to 7,000 ft. Also at higher elevations in the SIWALIKS.

Fl. and fr. Apr.-June.

18. Flemingia, Roxb.; G. P. n. 235.

Generally moderate-sized shrubs. Leaves digitately 3-foliolate or simple, gland-dotted beneath. Flowers generally in cymes. Calyx-tube short; teeth narrow, the lowest often the longest. Corolla scarcely exserted; petals equal. Stamens 2-adelphous. Ovary subsessile, 2-ovuled; style filiform, beardless; stigma capitate. Pod small, inflated, usually 2-seeded.

Analysis of the Species.

A. Leaves simple; bracts persistent, folding, (hiding the tlowers).

Leaves oblong-lance late, rounded at the base; axis of raceme zigzag.

Leaves orbicula, cordate; axis of raceme straight.

2. F. Chappar.

B. Leaves digitately 3-foliolate; bracts caducous, not folding.

Branches triquetrous; bracts linear, exceeding the flowers 3. F. stricta.

Branches scarcely angled; bracts lanceolate, shorter than the flowers.

Racemes condensed, shorter than the

petioles . . . 4. F. congesta.

1. **F. strobilifera**, R. Br.; Fl. Br. Ind. ii. 227; Brandis For. Flora 143, Ind. Trees 231; Gamble Man. Ind. Timb. 246.

An undershrub, usually about 5 ft. high; branches tenete, velvety. Leaves simple, 3-6 by 1-18 in., oblong-lanceolate, subacute, rounded at the base, subcoriaceous, glabrescent above, thinly silky-pubescent beneath; petiolo 2-7 in. long; stipules linear, scarious, 2-4 in. long. Racemes 3-6 in. long; rachis zigzag, downy; bracts 5-1 in. long, rather broader than long, deeply cordate, membranous, reticulate, downy, folded. Flowers 2-3 in. long; calyx hairy; corolla purple, little exserted. Pod 3-4 in. long, 2-seeded, downy.

Very common in blanks in Sal forests in the SIWALIK DIVISION, also in the HILLS, up to 3,000 ft.

The leaves are used for thatching.

Fl. Aug.-Nov. Fr. Cold season.

Very similar in appearance is *F. paniculata* Wall.; Fl. Br. Ind. ii. 227, but with panicled racemes, naked flowers and larger pods. Common near Lachiwala in the Dún. Fl. and fr. Mar. May.

2. F. Chappar, Ham.; Fl. Br. Ind. ii. 227; Brandis For. Flora 143, Ind. Trees 231; Gamble Man. Ind. Timb. 246. Vern. Sálján, Hind.; Chhánchra, E. Dún.

A gregarious undershurb often up to 7 ft. in height. Leaves simple, 2:5-4 in. diam., orbicular, cordate, acuminate, glabrescent above, more or less pubescent beneath, especially along the nerves, 3-nerved at the base; lateral nerves 6-8 pairs above the basal; petiole 6-1-5 in. long. Racemes often panicled; rachis woody, pubescent; bracts 1 by 1-5 in., cordate, deeply omarginate, membranous, reticulate, folded, salmon-brown when mature. Flowers 3-4 in.; corolla about half-exserted. Pod 3-4 in. long, 2-seeded, downy.

Characteristic of the moister localities in the Dun, e.g., Kaluwala, Lachiwala, Tirsal, Kansrao, Motichur, etc.

The roots are used in Hindu medicine.

Fl. Aug.-Oct. Fr. Cold season.

3. F. stricta, Roxb. Fl. Br. Ind. ii. 228; Brandis Ind. Trees 232; Gamble Man. Ind. Timb. 246. Vern. Bebar, Garh.

A tall shrub, 6-10 ft. high; branches triquetrous, hairy. Leaves digitately 3-foliolate; petiole 4-5-5 in. long, 3-quetrous, furrowed; stipules 2 in. long, striate, caducous. Leaflets 6-12 by 2-5-4 in., oblong, narrowed at both ends, quite glabrous above, thinly hairy along the nerves beneath, very shortly petioluled, 3-5-nerved at the base; lateral nerves 12-16 pairs; glandular dots few, minute, black. Racemes 3-4 in. long, dense-flowered; bracts '6-1 in., linear subulate, scariose, rigid; pedicels very short. Flowers '5 in. long.; calyx-teeth linear, the lowest much longer than the others; corolla as long as the lowest tooth. Pod '5 in. long, glabrescent.

Common at Karwapani in the Don, and also in low valleys in the Hills.

Fl. Mar., Apr. Fr. Aug., Sept.

4. **F. congesta,** Roxb.; Fl. Br. Ind. ii. 228; Brandis For. Flora 143, Ind. Trees 232; Gamble Man. Ind. Timb. 246. Vern. Banchhúi, Dún.

An erect undershrub, 4-6 ft. high; branches slightly ribbed. Leaves digitately 3-foliolate; petiole 2:5-4 in. long, flattened; stipules 5 in. long, linear, caducous. Leaflets 4-6 by 2-3 in., ovate- or oblong-lanceolate, glabrous above but pubescent and with brown or outby-coloured glandular dots and hairy along the nerves beneath; the lateral oblique; base strongly 3-nerved; main lateral nerves about 6 pairs above the basal. Racemes dense, 1-2 in. long, sessile; bracts 12-25 in. long, lanceolate, membranous, not rigid, greysilky outside, deciduous; podicels very short. Flowers about 5 in. long; calyx densely silky, teeth lanceolate; corolla scarcely exserted. Pod 3-5 in. long, turgid, 2-seeded, obscurely downy; seeds 1 in. diam., shining, brown or blue-black.

Very common in the Dún, especially in Sal forests.—Lachiwála, Karwápáni, etc.

A dye may, be obtained from the hairs of the pod.

Fl. Apr.-Aug. Fr. Cold season.

5. **F. semialata**, Roxb.; Prain in Journ. As. Soc. Beng. lxvi, Part ii, No. 2, 439-441; Brandis For. Flora 143, Ind. Trees 232; Gamble Man. Ind. Timb. 246. Syn.—F. congesta, var. semialata, Fl. Br. Ind. ii. 229. Vern. Bará Sálpán, Hind.

A shrub closely resembling the last, but generally much taller, the *petiole* is shorter and narrowly winged towards the upper end, g andular dots often absent, the *racemes* longer (3-6 in.) and laxer and the *calyx-teeth* narrower.

As common as the last species, in much the same localities.

Fl. Apr.-Aug. Fr. Cold season.

F. prostrata, Roxb.; Prain in Journ. As. Soc. Beng. xvi, Part ii, No. 2, 440;—is simply a prostrate form of F. congesta with tawney pubescent inflorescence. Found near Lachiwala, Hardwar, etc.

19. Dalbergia, Linn. fil.; G. P. n. 236.

Trees, rarely climbing shrubs. Leaves imparipinnate; leaflets alternate, subcoriaceous, without stipels. Flowers small, in terminal or lateral panicles; bracts and bracteoles small. Calyx campanulate; teeth 5, short. Corolla exserted; standard broad; wings oblong; keelpetals shorter than the standard, connate at the tip. Stamens 9-10, diadelphous or monadelphous; anthers minute. Ovary stipitate, few-ovuled; style short, incurved, glabrous; stigma capitate. Pod thin, flat, coriaceous, 1-4-seeded, indehiscent.

Analysis of the Species.

Leaflets acuminate; stamens monadelphous . 1. D. Sissoo. Leaflets obtuse; stamens diadelphous.

Leaflets 11-15; panicles large, lax . 2. D. lanceolaria. Leaflet; 17-25; panicles small, compact . 3. D. sericea.

1. **D. Sissoo**, Roxb.; Fl. Br. Ind. ii. 231; Brandis For. Flora 149, Ind. Trees 233; Gamble Man. Ind. Timb. 247. Vern. Shisham, Sissú, Hind.; Táli, Punjab.

A fairly large tree; bark grey, somewhat reticulately longitudinally furrowed, exfoliating in narrow strips; young parts greydowny. Leaflets 3.5, distinctly alternate, 1.2.5 in diam., broadovate or rhomboid, tough, acuminate, glabrescent; lateral nerves yesunder; rachis 2.4 in long, zigzag, pubescent when young; petiolules 1.2 in long. Flowers 2.3 in long, pale-white, in racemes

1-1.5 in. long, which are arranged in short axillary panicles. Ca'yx downy, about half the length of the flower. Standard with a long claw. Stamens 9, united in a sheath which is slit along the top. Ovary pubescent; style much shorter than the ovary; stigma large. Pod 2.3 by '3.-5 in., strap-shaped, glabrous, pale-brown, a large proportion 1-seeded, narrowed at the base to a stipe '3.-4 in. long. Seeds '25 in. long, kidney-shaped, flat.

Indigenous in the banks and beds of streams and on sandy soils in the SIWALIK DIVISION, also in the Tons Valley, JAUNSAR. Extensively planted in avenues and as a nurse and a fertiliser in tea-gardens in the Don.

The heartwood is brown, mottled with darker longitudinal veins, hard and close-grained; annual rings not distinctly marked; medullary rays very fine; pores uniformly distributed, joined by wavy white concentric bands; weight 45-55lbs. per c. ft. "It is very elastic, seasons well, does not warp or split, and takes a fine polish."—Sir D. Brandis. It is highly esteemed for all purposes where strength and elasticity are required, its use being limited only by the supply. The twigs and leaves are lopped for fodder.

The tree can be easily raised from seed, e.g.. Shahdera and Changa Manga plantations in the Punjab, and also from root-

cuttings, e.g., at Jeypore in RAJPUTANA.

Leafless Jan., Feb. New leaves Feb., Mar. Fl. Mar.-May; Fr. Nov.-Feb., remaining long on the tree.

Allied to the Sissu is D. latifolia, Roxb., Fl. Br. Ind. ii 231; Brandis Ind. Trees 233, the Blackwood or Rosewood tree of S. India. Vern. Waláyti Shisham, Hind. The bark is of a lighter colour and less furrowed, the leaflets thicker and emarginate, and the pod larger and firmer. The wood is even more valued than that of Sissu. It has a spreading crown with thick boughs and is often planted in avenues, e.g., at Máyápur near Hardwar.

2. D. lanceolaria, Linn.; Fl. Br. Ind. ii. 235; Brandis, For. Flora 151, Ind. Trees 236; Gamble Man. Ind. Timb. 253.

A large deciduous tree with glabrous branches; bark smooth, greenish-grey, yellow inside but instantly turning brown on exposure. Leaflets 11-15, 1-2 by '6-1-2 in., elliptic or oblong, acute or emarginate, subcoriaceous, pale beneath. Flowers '2-'4 in. long, dull-white, in large lax terminal and axillary panicles. Calyx about '1 in. long, silky outside. Standard obovate, '25 in. broad, clawed, keel short. Stamens 10, equally diadelphous. Ovary 3-ovuled, hairy at the base. Pod 2-3 by '5-'7 in., narrowed at both ends, on a stipe 3-5 in. long, glabrous, flexible, bright-brown, generally 1-seeded, reticulate over the seed.

Occasionally met with in the SIWALIK TRACTS and in valleys in the OUTER HILLS. Very scarce. Chirak Block, along the Jhabri Sot in the Mayapur Block. Also found by Mr. A. Smythies at Ráiwála in the DÚR.

Wood white or vellow, moderately hard, not durable, no heartwood; weight 33-44 lbs. per c. ft.

Fl. May, June. Fr. Sept., Oct.

3. D. sericea. G. Don : Prain in Journ. As. Soc. Beng. Vol. 70. 51; Brandis Ind. Trees 237.—Syn. D. hircina, Ham.; Fl. Br. Ind. ii. 236; Brandis For. Flora 151, Gamble Man. Ind. Timb. 255.

A small tree; young parts ferruginous-tomentose. Leaves 6-10 in. long. Leaftets 17-25, 1-1.5 by 6-9 in., ovate or elliptic. emarginate or rounded at the tip, rather membranous, clothed with very minute grey hairs. Flowers about 25 in. long, in short congested axillary corymbose panicles, 1-2 in. long. Calyx about '1 in. long, densely pubescent. Standard obovate, 12 in. broad, gradually narrowed into a claw. Stamens 10, equally 2-adelphous, Ovaru hairy. Pod 1-1.5 by 2-3 in., 1-3-seeded, but less frequently 1-seeded than in the last two species.

OUTER HIMALAYA, e.g., Málköt, Sahansra-dhárá, below Mussoorie, etc.; also in TEHRI-GABHWAL, up to 5.500 ft.

Fl. Apr., May. Fr. July, Aug.

D. paniculata, Roxb., Fl. Br. Ind. ii, 236, is a tree which has leaves and pods exactly like those of *D. lanceolaria*, but the panicles are much smaller. The wood is of a curious structure, consisting of thin layers of fibrous tissue, resembling the inner bark. alternating with masses of white wood. The tree is very scarce in our region having been only once found in the E. Saharanpun SIWALIKS by the late Mr. N. Hearle.

20. Sophora, Linn.; G. P. n. 273.

1. S. mollis. Grah.; Fl. Br. Ind. ii. 251; Brandis For. Flora 132. Ind. Trees 244; Gamble Man. Ind. Timb. 264. Vern. Sákiná. Garhwal, -- a name also applied to all shrubby Indigoferas, which it somewhat resembles in foliage.

A low shrub with grey-downy branches; bark dark-grey. Leaves imparipinnate, 4.6 in. long. Leaflets 21-35, 5-1 in. long. elliptic, obtuse, emarginate, subcoriaceous, grey-green, finely greydowny, prominently veined. Racemes 2.4 in. long, axillary, ascending. Flowers about 1 in. long, yellow, developed before the leaves. Calyx '15.'2 in. long, oblique, grey-downy. Corolla '6.'8 in. long; petals equal in length, clawed; standard broad. Stamens free; anthers versatile. Ovary stalked, many-ovuled; style incurved. Pod 3.4 in. long, 4.6 seeded, slightly pubescent when young, glabrous when mature, distantly moniliform; joints with 4 crustaceous wings, two along each suture; seeds brown, hard, shining.

Sahansra-dhárá and probably also in similar other localities in the OUTER HIMALAYA.

The wood is used for fuel, and the leaves and twigs for fodder. Fl. Mar., Apr. when leafless. Fr. Rainy season.

The following plants of this Sub-Order deserve mention:—

- 1. Eschynomene aspera, Linn.; Fl. Br. Ind. ii. 152; Brandis Ind. Trees 224. The Sola plant. Vern. Sola, Hind. Stem erect, full of white pith-like light wood, 5-6 ft. high, 1-1.5 in. diam. Leaves imparipinnate; leaflets very small, numerous. Flowers yellow, about 7 in. long. Pod 2-2.5 by 3 in., long-stalked, with 3-6 separating joints. Found in swamps in the Pathri Forest. The socalled pith is made into hats and is used as floats by fishermen. Fl. Rainy season. Fr. Nov., Dec.—G. P. n. 159.
- 2. Uraria picta, Desv.; Fl. Br. Ind. ii. 155. A little-branched erect perennial, 3-6 ft. high. Leaves paripinnate; leaflets 4-8 by 2-1 in., strongly net-veined beneath. Flowers small, in a dense cylindrical terminal raceme about a foot long. Pod twisted, of 3-6 white polished indehiseent but separating joints. Found about Dehba Dén and the Outer Himalaya.—G. P. n. 174.
- 3. Uraria lagopus, DC.; Fl. Br. Ind. ii. 156;—has also been found in the same localities. Leaves 1- and 3-foliolate; leaflets 2-4 by 1:5-2 in., oblong, subcoriaceous, strongly net-veined. Racemes long, both axillary and terminal; pedicels woolly. Joints 2-6, dark or pale.
- 4. Uraria hamosa. Wall.; Fl. Br. Ind. ii. 156;—is an undershrub somewhat resembling a Desmodium. Leaves 1-3-foliolate; leaflets 3-5 by 2-3 in., oblong. Racemes 6-12 in. long, lax; bracts cuspidate. Corolla about 4 in. long, much exceeding the calvx. Joints 4-6, opaque. Found in swampy places in the Dun, e.g., Nakraunda.
- 5. Alysicarpus vaginalis, DC.; Fl. Br. Ind. ii. 158. A little-branched erect undershrub, 1-4 ft. high. Leaves simple or 3-folio late; leaflets 5-2 in. long, broad or very narrow. Calyx about 12

in. long; corolla included. Pod '5-'7 in. long, terete; joints indehiscent. Found at Lachiwala in the Dun.—G. P. n. 176.

- 6. Shuteria vestita, W. & A.; Fl. Br. Ind. ii. 181. A slender climber with pinnately 3-foliolate leaves; leaflets 1-2 in. long, obovate-oblong, glabrescent. Flowers reddish, 3-4 in. long, in axillary racemes, 1-4 in. long. Pod 1-15 in., linear, flat, recurved, 5-6-seeded. Found in the HILLS, up to 6,000 ft.; Málköt, Korwá Forest, etc.—G. P. n. 195.
- 7. Atylosia mollis, Benth.; Fl. Br. Ind. ii. 213. Vern. Ban Sem, Garhwal. A middle-sized twining shrub; young parts inflorescence and leaves beneath densely grey- or rusty-tomentose. Leaves 3-foliolate; leaflets 1·5-3·5 in. long, roundish-obovate, cuspidate, stipellate. Flowers ·6-·8 in. long, yellow, in lax racemes; calyx grey-downy, half the length of the flower. Pod 1-2 by ·4 in., 4-9-seeded, with transverse lines between the seeds. Common throughout the Dén and Outer Himalaya, and also along the foot of the Saháranpur Siwaliks. Fl. Dec., Jan, Fr. Mar., Apr.—G. P. n. 231.
- 8. Atylosia scarabæoides. Benth.; Fl. Br. Ind. ii. 215;—is a twining biennial found in ráu-beds in the SIWALIK TRACT. Leaves 3-foliolate; leaflets 1-5 in. long, obovate-oblong, subcoriaceous, densely grey-downy beneath. Flowers 2-6 on a short peduncle, about 5 in. long, yellow; corolla about 3-times the length of the calyx. Pod about 1 by 25 in., 4-6-seeded, densely grey-silky.

SUB-FAMILY II. CESALPINIEE.

Mostly trees or shrubs. Leaves abruptly pinnate or bipinnate, sometimes 2-foliolate or simple and 2-lobed; leaflets rarely stipellate. Flowers 2-sexual, generally irregular. Calyx divided to or nearly to the base; lobes usually 5, rarely valvate, generally concave. Petals 5, imbricate, quite free, slightly unequal, the upper or odd petal innermost. Stamens normally 10, usually free, often declinate; anthers large. Pod often indehisoent. Seeds sometimes albuminous.

Analysis of the Genera.

Leaves bipinnate; petals 5	1. CÆSALPINIA:
Leaves pinnate.	
Petals 5; stamens free, generally all perfect	2. CASSIA.
Petals 3; stamens monadelphous, only 3	1
perfect	3. TAMARINDUS.
Leaves simple, 2-lobed; petals 5	4. BAUHINIA.

1. Cæsalpinia, Linn.; G. P. n. 308.

Trees, erect shrubs, or prickly climbers. Leaves abruptly bipinnate. Flowers showy, yellow, in axillary or terminal racemes, the latter often corymbose. Calyxlobes 5, imbricate, hood-shaped, many times larger than the tube, the lowest largest. Petals 5, usually clawed, the uppermost smaller than the others. Stamens 10, free, declinate; anthers versatile. Ovary sessile few-ovuled; style filiform. Pod various.

Analysis of the Species.

Pod armed with wiry prickles . . 1. C. Bonducella. Pod not armed, quite smooth . . 2. C. sepiaria.

1. C. Bonducella, Fleming; Fl. Br. Ind. ii. 254; Brandis For. Flora 156, Ind. Trees 246; Gamble Man. Ind. Timb. 267. Vern. Káth Karanj, Hind.

A scandent prickly shurb. Leaves over a foot long; pinnæ 6-8 pairs, 3-8 in. long; stipules large, 2-fid; rachis and its branches armed with recurved prickles. Leaflets 6-10 pairs on each pinna, epposite, 7-1 by 4-6 in., oblong or elliptic, obtuse, mucronate, membranous, downy beneath, minutely petioluled. Racemes 6-12 in. long, gradually denser towards the top; pedicels 2-3 in., downy; bracts 5 in. long, linear-lanceolate, generally recurved at the tip, exceeding the flower-buds. Calyx 2-3 in. long, finely rusty-tomentose. Petals 4-5 in. long, oblanceolate, yellow, the smallest sometimes spotted with red. Pod 2-3 by 1.5-2 in., coriaceous, dehiscent, thickly beset with sharp wiry prickles 2-3 in. long. Seeds 2-3, 7 in. long, globose or ovoid, shining, lead-coloured, with numerous very fine horizontal cracks when dry.

SAHÁRANPUR and the Dún, generally in abandoned village sites or in hedges; Sháhjahánpur; Dúdhli. Tháno, Khairi. etc. Also at Kálsi in JAUNSAR.

The tender shoots and seeds which are known as fever-nuts in some parts are used medicinally, the farina of the cotvledons. which is white and very bitter, being considered a good substitute for quinine. It makes an effective hedge-plant.

Fl. Aug., Sept. Fr. Cold season.

2. C. sepiaria, Roxb.; Fl. Br. Ind. ii. 256; Brandis For. Flora 156, Ind. Trees 246; Gamble Man. Ind. Timb. 267, The Mysore-thorn. Vern. Alai, Dun; Ari, Jaunsar; Karani, Hind.

A large prickly climber, pubescent or downy; prickles strong. recurved or less frequently curved upwards. Leaves 9-16 in. long; pinnæ 6-10 pairs, 2-4 in. long; stipules semisagittate, deciduous. Leaflets 8-12 pairs on each pinna, opposite, 6-8 by 2-4 in., oblong. very obtuse, green and glabrous above, glaucous beneath, minutely petioluled. Racemes simple, about 1 ft. long; pedicels 7-1 in. long. jointed at the top; bracts lanceolate, rusty-tomentose. Calyx pale-yellow, about 5 in. long, deeply 5-lobed, pubescent or tomentose. Petals 5-7 in. long, bright-yellow. Stamens 5 in. long. exserted; filaments thickened and woolly at the base. Pod 2:5-4 by about 1 in., somewhat woody, glabrous, obliquely cuspidate, tardily dehiscent. Seeds 4-8, ovoid, 4 in. long, rather compressed, smooth, mottled brown and black.

Common in swampy localities in the Dun, and also in ravines in JAUNSAR and TEHRI-GARHWAL, ascending to 6,000 ft .- Nakraunda, Jogiwála, Bagúr Block near Kathián, Tons Valley, etc.

It is an excellent hedge-plant. The bark is astringent and may be used for tanning.

Fl. Mar.-June. Fr. Rainy season.

2. Cassia, Linn.; G. P. n. 326.

1. C. Fistula, Linn.; Fl. Br. Ind. ii. 261; Brandis For. Flora. 164, Ind. Trees 253; Gamble Man. Ind. Timb. 271. Vern. Amaltás Hind. : Királa, Dún : Sinára, Garhwal.

A moderate-sized tree, wholly glabrous; bark greenish-grev. smooth up to middle age. Leaves paripinnate, 1-2 ft. long; rachis terote. Leaflets 4-8 pairs, 3-6 by 2-3 in., ovate or ovate-oblong, subcoriaceous, acuminate, entire : lateral nerves parallel, numerous. Flowers bright-yellow, in thyrsoid pendulous axillary racemes 12-18 in. long; pedicels 3-1 in., gradually longer towards the base of the raceme. Calyx 2-4 in. long, glabrous, caducous. Petals 8-1 in. long, shortly clawed, nearly equal. Stamens of 3 kinds,—3 about 1 in. long behind the ovary with large oblong anthers, 4-6 about 4 in. long in front of the ovary with diverging anther cells, the remaining 3-1 shorter and more slender being staminodes with indehiscent anthers; anthers of fertile stamens open by terminal pores. Ovary shortly stipitate; style incurved; stigma terminal. Pod up to 2 ft. long, 1 in. diam., cylindrical, smooth, hard, indehiscent, dark-brown when fully ripe, obscurely transversely ribbed and transversely fragile, septate into numerous 1-seeded cells. Seeds about 4 in. diam., compressed, albuminous, parallel with the septa.

Common throughout the Dún and Saháranpur Forests; also found in low valleys up to 4,000 ft. in Jaunsar and Tehri-Garhwal, e.g., Ámláwa Valley up to Saiá.

The heartwood is yellowish or brick-red, tough, very hard and extremely durable, excellent for posts, carts and agricultural implements; weight about 60 lbs. per c. ft. The dark-brown sweetish pulp of the ripe fruit is a strong purgative, and is an ingredient of spiced native tobacco. The gum exuded by the bark is astringent. The bark is used for tanning and dyeing. The twigs are often lopped for cattle fodder. It is a very handsome tree, and is often cultivated for ornament.

Scarcely ever wholly leafless. New leaves and fl. Apr. July. Fr. Cold season.

The following smaller plants belong to this Genus:

- 1. C. occidentalis, Linn.; Fl. Br. Ind. ii. 262. Vern. Chakunda, Hind. A diffuse undershrub. Leaflets 2-4 by 6-13 in., elliptic-lanceolate, acuminate. Flowers 5-7 in. diam.; petals yellow with reddish veins. Pod 3 by 4 in., compressed, glabrous. A weed common in blanks and along forest roads, especially in the Dúx.
- 2. C. Tora, Linn.; Fl. Br. Ind. ii. 263. Vern. Panwar, Dún. A gregarious annual with a whitish stem. Leaflets about 3 pairs, 1-17 by 7-13 in., obovate, mucronate. Flowers 4 in. diam., orange-yellow; sepals concave. Pod 6-9 by 15 in., tapering, curved, flexuose; seeds truncately cylindrical, about 2 in. long, length parallel to the sutures. A common weed in blanks and about villages in the Dún and in Saháranpur. Fl. July, Aug. Fr. Oct. Dec.

3. C. mimosoides, Linn.; Fl. Br. Ind. ii. 266. A diffuse perennial. Leaflets very numerous, '5 by '1 in., linear-oblong, acuminate. Flowers yellow, '3 in. long, in 2-3-flowered axillary racemes. Pod flat, 2-2.5 by '2 in., 10-14-seeded. Dún,—Ráipur, Rámgarh, Lachiwála, etc. Fl. July, Aug. Fr. Sept.-Nov.

3. Tamarindus, Linn.; G. P. n. 348.

1. **T. indica,** Linn.; Fl. Br. Ind. ii. 273; Brandis For. Flora 163, Ind. Trees 252; Gamble Man. Ind. Timb. 278. The Tamarind tree. Vern. Imli, Amli, Hind.

A large unarmed tree; bark dark-grey, with longitudinal fissures. Leaves abruptly pinnate; rachis 2-5 in. long; stipules small, caducous. Leaflets 10-20 pairs, opposite, '5-'7 by '15-'2 in... linear-oblong, obtuse, often emarginate, subcoriaceous, glabrescent, very minutely petioluled, with intramarginal nerves. Flowers in few-flowered lax sub-terminal racemes. Calyx-tube turbinate; teeth lanceolate, the two lowest connate. Petals only the 3 upper developed which are '4-'6 in. long, pale-white, variegated with red stripes, the middle one hooded, the two lower reduced to scales. Stamens only 3 perfect, monadelphous, the others reduced to bristles: anthers versatile. Ovary stipitate, the stalk adnate to the calvxtube: ovules many; stigma capitate. Pod 3-8 by 8-1 in., oblong, slightly compressed, usually falcate, many-seeded, indehiscent, with a crustaceous brittle epicarp which ultimately cracks irregularly: sutures indistinct. Seeds 5 in. diam., compressed, with a darkbrown or black hard shining smooth testa, embedded in a brown pulpy mesocarp.

Cultivated throughout the Dún and Saháranpue Districts for its fruit; almost wild towards Hardwar.

Sapwood yellowish-white, hard and close-grained. Very old trees produce a scanty ebony-like dark purplish-brown heartwood which is very durable; annual rings indistinct; weight about 75 lbs. per c. ft. Wood highly prized though extremely difficult to work. "It is used for wheels. mallets, planes, rice-pounders, oil and sugar mills and is an excellent wood for turning."—Sir D. Brandis. The fruit is an article of food and is also used in medicine. The leaves make an agreeable curry, and the inner substance of the seeds ground into paste gives a strong cement which is much used by bookbinders.

Fl. May, June. Fr. Mar., Apr., i.e., 10-11 months after flewering.

4. Bauhinia, Linn.; G. P. n. 333.

Trees, shrubs or climbers. Leaves simple, more or less distinctly 2-lobed, palmately nerved. Flowers white pink or purple, in simple or panicled racemes. Calyx gamosepalous, turbinate or tubular; limb 5-cleft, or split on one side (spathaceous) and minutely 5-toothed at the apex. Petals 5, sub-equal, usually clawed. Stamens 10, free, all or 3-5 perfect, the others rudimentary or absent; anthers versatile. Ovary stalked, manyovuled. Pod linear or oblong, flat, dehiscent or indehiscent. Seeds albuminous.

Analysis of the Species.

Fertile stamens 10; pod indehiscent. Leaves not acid; calyx spathaceous; pod rigid, falcate . 1. B. racemosa. Leaves acid; calyx 5-cleft; pod flexible, 2. B. malabarica. Fertile stamens 3-4, rarely 5; pod dehiscent. Lvs. cleft only at the tip or not cleft at all 3. B. retusa. Lvs. deeply cleft. A climber. Lvs. often broader than long 4. B. Vahlii. Trees. Leaves as long as broad. Leaves cleft nearly half way down; calyx-tube shorter than the limb. 5. B. purpurea. Leaves cleft scarcely through a third of their length; calvx-tube as long as the limb 6. B. variegata.

1. **B. racemosa**, Lam.; Fl. Br. Ind. ii. 276; Brandis For. Flora 159, Ind. Trees 256; Gamble Man. Ind. Timb. 281. Vern. Jhanjhorá, Jhinjhorá, Dún and Saháranpur; Pápri, Saháranpur.

A small deciduous tree; bark dark bluish-brown, rough, with numerous deep vertical cracks. Leaves broader than long, 8-2 by 1-3 in., cleft nearly half way down, 7-9-nerved, slightly cordate,

coriaceous, grey-pubescent beneath; petiole '5-'7 in. long. Raceme 3-5 in. long, terminal and leaf-opposed; rachis downy. Flowers pale-white, about 5 in. long, on short pedicels; buds oblanceolate, pointed at the tip; bracts subulate, deciduous. Calyx-tube about 1 in, long: limb about three times as long, entire, 5-toothed, at length reflexed. Petals oblanceolate, as long as the calvx-limb. Stamens 10, all perfect, united at the base. Stigma sessile. Pod 5-8 by '7-1 in., sometimes longer, turgid, rigid, falcate, 12-20-seeded. glabrous, irregularly reticulate outside.

Common in blanks and the drier parts of forests in Saharan" PUR and the DUN.

Wood light-brown, hard, weighing 50 lbs. per c. ft. It is fairly good, but not used except for fuel. The fibre of the bark is used to make ropes.

Fl. Mar.-June. Fr. Cold season.

2. B. malabarica, Roxb.; Fl. Br. Ind. ii. 277; Brandis For. Flora 159, Ind. Trees 256; Gamble Man. Ind. Timb. 282. Vern. Ámli, Hind.; Khat Pápri, Saháranpur; Khatta Jhanjhorá or Jhinihorá, Imli, Dún ; Khatuá, Garhwal.

A moderate-sized deciduous tree : bark dark-brown, exfoliating in thin long strips, fibrous, red inside. Leaves acid, broader than long, 1.5-4 by 2.5 in., cleft through about a third of the length. 7-9-nerved, slightly cordate, coriaceous, glabrate and glaucous beneath; petiole 8-1.2 in. long, rusty-pubescent. Racemes axillary. sessile, 1.5-2 in. long, often 2-3 together. Flowers 5 in. long, dullwhite, on very slender pedicels which are I in. long; buds obovoid. rounded at the tip. Calvx brown-tomentose; tube 15 in. long: limb slightly longer, 5-cleft. Petals equal, spathulate, 4-5 in. long. Stamens 10, all perfect, alternately longer and shorter, slightly united at the base. Style produced. Pod 7-12 by 7-1 in., on a stalk 1 in. long, flat, flexible, many-seeded, more or less straight, gradually tapering to the tip, marked with regular reticulate veins which. starting diagonally from both sutures, meet in the middle.

Common in the Dun and Saharanpur Forests, especially in the Sál areas.

Wood light reddish-brown, coarse-grained; weight 48 lbs. per c. ft. It is never used, except for fuel. The acid leaves are eaten.

Fl. Aug.-Oct. Fr. Jan.-May.

3. B. retusa, Ham.; Fl. Br. Ind. ii. 279; Brandis For. Flora 161, Ind. Trees 257; Gamble Man. Ind. Timb. 282. Vern. Semla, Hind.

A moderate-sized tree; individuals that escape tapping attaining a fairly large size; bark dark-brown, with a few shallow vertical cracks, but usually much disfigured by the diagonal cuts that are made to tap its gum. Leaves 4-6 in. diam., rather broader than long, entire or cleft only at the tip, cordate or truncate, 9-11-nerved, coriaceous, more or less pubescent beneath; petiole 1.5-3.5 in. long. Flowers 5 in. long, in large corymbosely branched terminal panicles; buds ovoid-globose. Calyx 2-3 in. long, split into 2-3 sections nearly to the base. Petals 3-4 in. long, obovate, yellow, with red spots and purple veins, clawed, pubescent. Stamens only 3 perfect. Ovary hairy below; stipe adnate to the calyx-tube; style produced; stigma large. Pod 4-7 by 1-2-1.5 in., flat, oblanceolate, deep-red until ripe, glabrous, hard, tardily dehiscent; seeds flat, about 5 in. diam., dark-brown, smooth.

Fairly common in the SIWALIK TRACT and in places in the OUTER HIMALAYA: Málköt, Paléd, Bindál-nálá near Dehra, Timli

Pass, Sháhjahánpur Ráu, etc.

Wood reddish-white, hard, close-grained; weight 58 lbs. per c. ft. It is not used. A clear gum resembling gum-arabic is collected by making cuts in the bark, and is largely exported from the Dún. It is used in medicine, and in the manufacture of sweetmeats. FI. Sept.-Nov. Fr. Feb., Mar.

Fr. Sept.-Nov. Fr. Feb., Mar.

4. **B. Vahlii,** W. & A.; Fl. Br. Ind. ii. 279; Brandis For. Flora 161, Ind. Trees 258; Gamble Man. Ind. Timb. 283. Vern. *Máljhan, Málo*, Hind.

A gigantic evergreen climber; branchlets often terminating in a pair of revolute tendrils; young branches, petioles and leaves beneath, especially along the nerves, densely rusty- or grey-velvety. Leaves very variable in size, often up to 18 in. across, as broad as long or broader, deeply cordate, 11-15-nerved, cleft through about a third of the length, sub-coriaceous, drak-green and glabrescent above. more or less downy beneath; lobes obtuse, rounded; petiole 3-6 in. long. stout. Flowers white, in terminal corymbs or corymbose racemes: pedicels 1-2.5 in. long, slender, with a lanceolate caducous bract at the base and a pair of small bracteoles above the middle, all densely woolly. Calyx-tube 2-3 in. long; limb 6-1 in. long, splitting into two lobes, densely rusty-tomentose. Petals 1-1.7 in. long, obovate, shortly clawed, white-canescent outside along the middle. Stamens 3. Ovary hairy, adnate to the calvx-tube. Pod 9-12 by 2-3 in., flat, woody, rusty-velvety. Seeds 8-12, about 1 in. diam., flat.

Common in the Dún and Saháranpur Forests, especially in moist localities and shady hill-slopes; also in the Outer Himalaya, up to 3,000 ft.

It often attains an enormous size, stems 4-5 ft. in girth not being uncommon. There is a famous climber on the left bank of the Kasumri Ráu above the temples which measured 6 ft. 7 in. in girth in January 1899. The stem consists of a mass of phloëm tissue which is traversed by strands of xylem of various thicknesses round the pith, together presenting a beautiful floral design on a transverse section. "Its large flat leaves are sewn together and used as plates, cups, rough table-cloths, umbrellas and rain caps; its pod is roasted and the seeds eaten; its bark is made into rough ropes."—Mr. J. S. Gamble. It is, however, one of the greatest enemies of forest trees, and every attempt is made to exterminate it where possible.

Fl. Apr.-June. Fr. Cold season.

5. **B. purpurea**, Linn.; Fl. Br. Ind. ii. 284; Brandis For. Flora. 160, Ind. Trees 258; Gamble Man. Ind. Timb. 283. Vern. Khairwál, Dún; Khairwál Pápri, Saháranpur; Guirál, Garhwal.

A moderate-sized tree; bark ash-coloured or dark-brown; young parts covered with brown pubescence. Leaves 3-6 in. long, rather longer than broad, 9-11-nerved, cordate, less frequently truncate, coriaceous, cleft about half-way down; lobes usually subacute, sometimes overlapping at the inner margins; petiole 1-1-5 in. long. Flowers deep-rose, in paniculate or corymbose recemes; pedicles 2-5 in. long, tomentose; buds obovoid or oblong, acute, strongly 5-ribbed. Calyx-tube 3-4 in. long; limb nearly twice as long, slit on one side, 5-toothed at the apex. Petals reddish, 1-5-2 in. long, oblanceolate, clawed, with a distinct midrib and fine straight lateral veins. Stamens usually 3 fertile, slightly shorter than the petals; staminodes filiform, of varying lengths. Ovary long-stalked; style long; stigma large, oblique. Pod 6-10 by 6-8 in., on a tomentose stipe 6-1 in. long, thick, pointed, slightly falcate, greenish-purple, pubescent along the sutures, late in dehiscing; seeds 12-15.

Common in the Saháranpur Siwaliks; also found in the Dún and in the Tons Valley in Jaunsar.

The heartwood is of a reddish-brown colour, moderately hard, fairly close-grained; weight about 50 lbs. per c. ft. It is used for agricultural implements and in construction. The bark is used for tanning, the leaves are lopped for cattle and camel fodder, and the flower-buds are eaten cooked or pickled. Often cultivated for its flower.

Fl. Sept.-Nov. Fr. Jan.-Mar.

6. **B. variegata**, Linn.; Fl. Br. Ind. ii. 284; Brandis For. Flora 160, Ind. Trees 258; Gamble Man. Ind. Timb. 284. Vern. *Kachnár*, Dún; *Goriáo*, Jaunsar. A fairly large tree, closely resembling the last species. Leaves 4-6 in. long, as broad as long or sometimes broader, usually deeply cordate, 11-15-nerved, sub-coriaceous, eleft through about a quarter; lobes obtuse; petiole 1-1.5 in. Flowers large, fragrant, sessile or shortly pedicelled, in few flowered lateral corymbs. Calyx-tube '5-1.2 in. long, slender; limb spathaceous, as long as the tube, 5-toothed at the apex, pubescent outside. Petals about 2 in. long, obovate or oblong, generally four white and one red, with a strong midrib and red or purple lateral veins radiating from near the base. Fertile stamens 5, rarely 3 or 4. Ovary long-stalked; style long; stigma minute. Pod 6-10 by '7-'9 in., hard, flat, glabrous, slightly falcate, dehiscent; seeds 10-15.

Occurring in the same localities as the last species, but is more common in the Dún and in valleys in the Hills, e.g., Amláwa and Tons Valleys.

Wood grey, moderately hard; weight $42\,\mathrm{lbs.}$ per c. ft. Economic uses as of the last species.

Fl. Feb.-Apr. when leafless. Fr. Rainy season.

SUB-FAMILY III. MIMOSE Æ.

Usually trees or shrubs. Leaves abruptly bipinnate. Flowers regular, minute, in heads or spikes. Sepals 5, usually combined, valvate. Petals 5, equal, more or less connate, valvate. Stamens definite or indefinite, hypogynous, generally much exserted; anthers small. Pod various. Seeds without albumen.

Analysis of the Genera.

Joints of pod separating; stamens 8-10, free . 1. Mimosa. Joints of pod not separating; stamens indefinite.

Armed.* Stamens free 2. Acacia.
Unarmed. Stamens more or less connate . 3. Albizzia.

^{*} Some Australian Acacias are not armed.

Mimosa, Linn.; G. P. n. 387.

1. M. rubicaulis, Lam.; Fl. Br. Ind. ii. 291; Brandis For. Flora 172, Ind. Trees, 263; Gamble Man. Ind. Timb. 290. Vern. Aláy, Dún; Al, Saháranpur.

A straggling prickly shrub; young branches red (whence the specific name), closely ribbed, thickly beset with short recurved prickles. Leaves 4-6 in. long, with prickly rachis; pinne usually opposite, 4-10 pairs, 1-1.5 in. long, not armed. Leaflets 12-28 on each pinna, '15-'3 in. long, oblong, unequal-sided, caducous. Flowers tetramerous, red to white, in globose heads which are '4-'6 in. across; peduncles 1-2 in. long. Calyx campanulate, shortly toothed. Petals '04 in. long, connate at the base. Stamens usually 10, exserted. Pod 3-4 by '4 in., linear-oblong, 5-10-seeded, slightly falcate, glabrous; joints square, separating from the sutures before dehiseing.

Common in grass-lands and fallows in the Dun and in raubeds in the Saharanpur Siwaliks. Also found in valleys in the

HILLS up to 5,000 ft.

Heartwood red, hard; weight 40-50 lbs. per c. ft. It can be used for tent-pegs and such other purposes.

Fl. July-Sept. Fr. Nov.-Jan.

M. pudica, Linn.; Fl. Br. Ind. ii. 291,—the well known Sensitive plant, Vern. Lájwanti, Hind.;—is cultivated and also found wild in waste lands in the Dún. Rachis 1-15 in. long. Pinnæ 1:5-2 in. long, approximate at the end of the rachis and spreading to look like digitate, very sensitive. Leaflets 2-3 in. long, sensitive. Flowerheads long-peduncled. Pod 5-8 in. long, with densely-prickly sutures. Fl. Aug., Sept. Fr. Nov., Dec.

2. Acacia, Willd.; G. P. n. 391.

Erect or climbing shrubs or trees, armed with stipular spines and prickles (in India). Leaves bipinnate; leaflets minute. Flowers yellow or white, hermaphrodite or polygamous, in globose heads or cylindrical spikes. Calyx campanulate, short-toothed. Petals valvate, more or less connate towards the base. Stamens indefinite, free, much exserted; anthers minute. Pod dry or fleshy, dehiscent or indehiscent; seeds compressed.

Analysis of the Species.

Trees or erect shrubs.			
Flowers in axillary globose heads; spines			
straight.	_	_	- .
Pod short, cylindrical; seeds in two rows.	l.	A.	Farnesiana.
Pod long, not cylindrical; seeds in one			
row.			
Pod convex, downy, deeply indented			
between the seeds	2.	A_{-}	arabica.
Pod flat, glabrous, slightly contracted			
Lou has, gladious, sagnery constructor	•		.1
between the seeds	J.	Д.	eburnea.
Flowers in axillary cylindrical spikes;			3
spines recurved	4.	A.	Catechu.
Climbing shrubs. (Flowers in copiously pani-			
cled globose heads).			
	5.	A.	concinna.
Pod dry, thin.			
Leaflets 5 by 15 in., few; stem fluted .	6.	A.	Inteia.
Leaflets 3 by 05 in., numerous; stem			15-1
. 4 . 1	7	A	manage 1
not fluted	1-	л.	pennata.

1. **A. Farnesiana**, Willd.; Fl. Br. Ind. ii.; 292 Brandis For. Flora 180, Ind. Trees 263; Gamble Man. Ind. Timb. 292. Vern. Walkyti Kikar, Hind.

A thorny shrub, 12-15 ft. high, with dark-brown smooth bark; branches marked with grey dots and armed with stipular spines '3-5 in. long. Leaf-rachises 1*5-2 in. long, downy; pinnæ 4-8 pairs, 1-1.5 in. long. Leafets 20-40 on each pinna, very small, rigid. Flouers bright-yellow, exceedingly sweet-scented, in globose heads which are '4-'6 in. diam.; peduncles '5-'8 in. long, slender, crowded in the axils of the leaves, with a whorl of bracts at the apex. Calyx and corolla 5-toothed. Pod 2-3 by '5 in., cylindrical, turgid, dark-brown, with a double row of seeds.

It is a native of tropical America and is, no doubt, introduced, but is quite wild now in the Don and Sanaranpur Districts, e.g., beds of the Suswa river; Pathri Forest; Barkala, etc. Also cultivated in gardens for its flower.

Wood white, hard, close-grained; weight about 50 lbs. per c. ft. An excellent perfume is extracted from the flower.

Fl. Jan.-Mar. Fr. June, July, but remains long on the plant.

2. A. arabica, Willd.; Fl. Br. Ind. ii. 293; Brandis For. Flora 180, Ind. Trees 264; Gamble Man. Ind. Timb. 292. Vern. Babul, Hind.; Kikar, Saharanpur and the Punjab.

A moderate-sized tree with a large spreading crown; bark dark-brown, almost black, much fissured; spines 5-2 in. long, straight, white, sharply pointed. Leaves 1-2 in. long; rachis and pinnæ downy; pinnæ 3-6 pairs, 5-12 in. lerg, with several glands at their insertions. Leafets 10-20 pairs. 1-2 in. long, linear, glabrous. Flowers yellow, fragrant, in axillary globose heads which are about 5 in. diam.; peduncles in fasciles of 3-5, short, slender, grey-downy, with a whorl of bracts above the middle. Calyx cup-shaped, '04 in. long. Corolla twice the length of the calyx. Pod generally solitary, 4-6 by 5-6 in., 8-12-seeded, stalked, convex, rather fleshy, deeply indented between the seeds, densely grey-downy, tardily dehiscent.

Cultivated in the Saháranpur District, and apparently self-sown in many places, e.g., at Ránipur, Jawálapur, Tirá, etc.

Sapwood large, whitish; heartwood becoming reddish or dark brown on exposure; weight about 55 lbs. per c. ft. The latter is hard and very durable, and is used for wheels, well-curbs, sugar- and oil-presses, rice-pounders and for ploughs and other agricultural implements. The gum is readily soluble in water and is largely collected and used for various purposes. The pod is a favourite food for cattle, sheep and goats, and is very rich in tannin before ripening.

Fl. Rainy season. Fr. Cold season.

3. A. eburnea, Willd.; Fl. Br. Ind. ii. 293; Brandis For. Flora 183, Ind. Trees 264; Gamble Man. Ind. Timb. 294. Vern. Pahári Kikar, Saháranpur; Kikar, Dún.

A small deciduous tree with rough dark-grey bark; spines straight, generally dark-brown and about '5 in. long, the larger ones white and up to 2 in. long. Leaves 1-15 in. long; pinnes usually 4 pairs, '3-'5 in. long, the uppermost pair with a large gland at the insertion besides often a second one below the lowest pair. Leaflets 8-12 pairs, about '1 in. long, oblong. Flowers pale-yellow, in axillary globose heads about '5 in. diam.; peduncles 1 in. long, filiform, with an involucre of connate bracts about '3 in. from the base. Calyx funnel-shaped, '04 in. long. Corolla about twice the length of the calyx. Pod 2-4 on the same peduncle, 3-6 by '25 in., narrow-linear, flat, stalked, rigidly coriaceous, glabrous, shining, slightly contracted between the seeds.

Common in the Sahāranpur Siwaliks, generally in beds of raus, where it is associated with Khair. Also found in the Døn, e.g., at Sahanspur and Dharmawala.

Wood yellowish white, extremely hard, splitting in drying; weight 52 lbs. per c. ft. It is used chiefly as fuel, especially for lime-burning.

- Fl. Cold season, rarely Mar., Apr. Fr. about 4 months after flowering, generally Apr., May.
- 4. A. Catechu, Willd.; Fl. Br. Ind. ii. 295; Brandis For. Flora 186; Gamble Man. Ind. Timb. 292. Vern. Khair, Hind.

A moderate-sized tree with thorny branches; stipular spines in pairs, short and recurved, shining-brown or nearly black; bark rough, dark-grey or ash-coloured, exfoliating in long narrow rectangular flakes. Leaves 4-7 in. long; rachis prickly and with 4-5 glands; pinnæ 20-60, 1-1·3 in. long. Leaftets 60-100 on each pinnæ, about 15 in. long, ligulate. Flowers pale-yellow or cream-coloured, in laxaxillary cylindrical spikes which are 3-4 by 4 in.; peduncle '5-7 in. Calyx about '04 in. long, grey-tomentose. Corolla two to three times longer than the calyx. Stamens numerous, much exserted. Pod 2-3·5 by '5-'6 in., on a stalk '2-'3 in. long, straight, flat, dry, dark-brown, shining, 5-6-seeded. Seeds '2 in. diam., orbicular, flat, dark-brown.

Common in the Dún and the Saháranpur Siwaliks, generally in ráu-beds, either pure or mixed with Sissu; occasionally also in mixed scrub forests and on hill-sides away from the ráus.

Sapwood comparatively large, yellowish-white, not durable. Heartwood dark-red, so hard as to be proof against white-ants, hence very durable, seasons well and takes a fine polish. The weight varies between wide limits, the average being about 60 lbs. oer c. ft. Pores distinct, being usually filled with a white substance which is in fact the kathá or catechin. This substance, as well as the cutch—products of great commercial value,—are obtained by boiling chips of heartwood in earthern pots. The wood is used for rice-pestles, sugarcane- and oilseed-crushers, ploughs, sword-handles and various other purposes. There is, however, a local superstition against it, in common with other thorny trees, owing to which it is never used in house-building in this part of the United Provinces. It yields the best charcoal for blacksmith's work. The astringent bark is sometimes used for tanning.

- Fl. May-July. Fr. Nov.-Jan., but remains long on the tree after ripening.
- 5. A. concinna, DC.; Fl. Br. Ind. ii. 297; Brandis For-Flora 188, Ind. Trees 269; Gamble Man. Ind. Timb. 291. Vern. Alláh, Hind.

A large climbing shrub, subtreet up to about middle age; stem terete, greyish-brown, with 5 vertical lines of strong conical prickles; branches grey-canescent. Leaf-rachises 4-8 in. long downy, with a large gland about 5 in. above the base and a smaller

one between the uppermost pinnæ; pinnæ 3-6 pairs, 2-3.5 in. long; stipules '25-'3 in. long, lanceolate. Leaflets acid, 6-20 but generally 10-14 pairs on each pinna with a small odd one near the base. 5-6 by 1-25 in., linear, oblique at the base, quite rounded at the tip, membranous, pale-green above, glaucous beneath; midrib somewhat diagonal. Panicles 3-4 ft. long, interrupted with leaves at the base of the ramifications; peduncles 1-1.5 in. long, slender, downy, in fascicles of 2-4, lower in the axils of the leaves, upper bracteate; bracts '15-'25 in. long, obliquely oboyate-cordate, deciduous. Heads '4-5 in. diam., 55-60-flowered, brick-red in bud. Flowers '2 in. long. Calyx deep-crimson, about 1 in. long, tubular, deeply 5toothed: teeth subscute. Petals acute, white with a reddish median line, slightly exserted. Stamens numerous, much exserted, at first white, withering yellow; filaments very slender. Pod 3-4 by '7-1 in., straight, thick, fleshy, 6-10-seeded, slightly indented between the seeds: sutures broad.

Nawada in the Dun, and in the Amlawa valley near Tilwari in Jaunsan; rather rare, but remarkably gregarious where it occurs.

The pods are used for washing the hair, and the acid leaves are eaten.

Fl. Apr., May. Fr. Cold season.

6. A. Intsia, Willd.; Fl. Br. Ind. ii. 297; Brandis For. Flora 189, Ind. Trees 268; Gamble Man. Ind. Timb. 300. Vern. Alsy, Hind.

A large prickly climber, at first with 5 vertical lines of hooked prickles, afterwards deeply 5-fluted along those lines, subcreet and bushy in early youth; bark grey. Leaf-rachises 5-7 in. long, angled; with a gland near the base, and 0 or 2-3 below the upper pinnæ; pinnæ 6-8 pairs, 2-3 in. long. Leaflets 8-12 pairs, '3-'5 by '15-'2 in., ligulate, dark-green, nearly glabrous and shining above, pale beneath. Panicles large, leafless. Heads pale-yellow, peduncled, '4-'5 in. diam., brown in buds, generally 1-4 together. Pod 4-6 by '7-1'2 in., strap-shaped, dark-brown, finely pubescent, hardly stalked.

Fairly common in the vicinity of the Jumna, both in Saná-Banpur and the Dún, e.g., Khárá, Bádsháhibágh; Dákhpathar, etc. Also Khairi swamp, E. Dún.

The bark is said to be used as a substitute for soap in washing the hair.

Fl. Apr.-Aug. Fr. Dec.-Mar.

A. casia, W. & A.; Prain in Journ. As. Soc. Beng. lxvi. Part ii, No. 2, 510. Syn.—A. Intsia, var. casia, W. & A.; Fl. Br. Ind.

ii. 297,—is the form occasionally met with in the Dun and Sahabanpur Forests, e.g., at Khairi, Tháno; Barkálá, etc. Stems fluted like the above, but always climbing, usually on tall trees. Pinnæ and leaftets nearly twice as many, the former (and the rachis) pubescent, the latter firm, ciliate, glabrate above, hairy beneath, tip acute. Pod somewhat smaller, reddish-brown, glabrous, dehiscent, narrowed to a short stalk.

Fl. Rainy season. Fr. Nov.-Jan.

6. A. pennata, Willd.; Fl. Br. Ind. ii. 297; Brandis For. Flora 189; Gamble Man. Ind. Timb. 300. Vern Agiá-bel, Agiá, Aláy, Dún.

A prickly climber, attaining a larger size than any other climbing Acacia; bark reddish-brown, with horizontal cracks. Leafrachises 6-10 in. long, not angled, downy, with a large dark-brown gland near the base of the petiole, and several between the upper pinne, closely prickly; pinne 10-15 pairs, 2-3 in. long. Leaftets 80-100 on each pinna, 2-3 by 03-05 in., firm, quite glabrous, dark-green and shining above. Panicles 1-5-2 ft. long; peduncles 1-4 together, 6-9 in. long, finely downy. Heads 5 in. diam. Flowers pale, smaller than in the last three species. Pod 4-6 by 6-1 in., straight, strap-shaped, reddish-brown, glabrous, 8-12-seeded; stalk 25 in. long; sutures raised.

Very common in the Dún and Saháranfur Forests, especially in the moister parts, spreading over the tallest trees.

Wood yellowish-white, porous, moderately hard.

Fl. June-Aug. Fr. Nov.-Jan.

3. Albizzia, Durazz.; G. P. n. 394.

Unarmed trees. Leaves bipinnate; leaflets opposite. Flowers 2-sexual, in large globose heads, usually white or rose-coloured. Calyx tubular or campanulate, distinctly toothed. Petals 4-5, valvate, united below the middle. Stamens indefinite, many times the length of the corolla; filaments united at the base, sometimes forming a long sheath. Ovary sessile or shortly stalked; style filiform; stigma minute. Pod large, thin, flat, strap-shaped, straight, sub-indehiscent; seeds compressed.

Analysis of the Species.

Flower-heads on corymbosely arranged simple peduncles; flowers shortly pedicelled.	
Leaflets few, oblong, more than 5 in.	
broad	1. A. Lebbek.
Leaflets many, falcate and tapering,	
scarcely 2 in. broad	4. A. mollis.
Flower-heads in panicles; flowers sessile.	
Leaflets ovate-oblong, more than 5 in.	
broad	3. A. procera.
Leaflets linear-oblong, about 2-3 in.	
broad	2. A. odoratissima
Leaflets falcate and tapering, scarcely	
ilim based	5. A. stipulata.
1 m. broad	o. m. supuvuva.

1. A. Lebbek, Benth.; Fl. Br. Ind. ii. 298; Brandis For. Flora 176; Ind. Trees 271; Gamble Man. Ind. Timb. 303. Vern. Siris, Sirás or Sirsá, Hind.

A large deciduous tree with a spreading crown; bark dark-grey, irregularly cracked. Leaf-rachiess 5-6 in. long, stout, with a large oblong gland near the base, and 1 or more smaller ones between the upper pinnæ; pinnæ 2-6 pairs, 4-6 in. long. Leaftets 4-9 pairs, 1-3-2 by '7-1 in., shortly petioluled, oblong, oblique, obtuse, glabrous or glabrescent; midrib nearly paralled to the upper edge; lateral nerves not very prominent. Peduncles 2-4 in. long, downy, in fascicles of 2-4 from the upper axils, forming short corymbose racemes; heads many-flowered. Flowers greenish-white, shortly pedicelled, fragrant, about 1.5 in. long to the extremities of the stamens. Calyx funnel-shaped, '15 in. long, short-toothed. Corolla twice the length of the calyx; segments lanceolate. Filaments 1-1.5 in. long, rose-tinted, united inside the calyx-tube. Pod 8-12 by 12-1.7 in., flat, thin, firm, straw-coloured, 6-10-seeded, with brown spots and depressions alternately on either side over the seeds.

Common, though not numerous, in the Dún and Saháran-PUR FORESTS, and also in low valleys in Jaunsar, generally along banks of streams.

Sapwood large, white; heartwood dark-brown, mottled and streaked with a darker colour, tough, hard, fairly durable, seasons well, and takes a fine polish; weight 50-55 lbs. per c. ft. It is used for sugarcane-crushers, oil-mills, well-curbs, wheel-work and furniture. The leaves and twigs are lopped for camel-fodder. The tree is often planted in avenues. It is a rapid grower and can be easily propagated by cuttings.

New leaves Mar., Apr. Fl. Apr., May. Fr. Oct., Nov. but remains long on the tree.

2. A. odoratissima, Benth.; Fl. Br. Ind. ii. 299; Brandis For. Flora 175, Ind. Trees 271; Gamble Man. Ind. Timb. 304. Vern. Káli Siris, Hind.

A fairly large tree having a general dark appearance; bark dark-grey with patches of darker colour; extremities grey-tomentose. Leaf-rachises 4-7 in. long, downy, with a gland near the base and 1-2 more at the points of insertion of the upper pinnæ; pinnæ 3-8 pairs, 3-5 in. long. Leafets 8-20 pairs, generally about 1 by 2 in., sometimes much broader, linear-oblong, unequal-sided, acute, minutely mucronate, dark-green, glaucous beneath; midrib paralled to the upper edge and close to it. Inflorescence a terminal (rarely axillary) panicle, 10-15 in. long, with corymbose branches on which the peduncles are disposed in fascicles. Heads few-flowered; peduncles 5-8 in. long. Flowers sessile, pale-white, fragrant. Calyx about 04 in. long, hairy. Corolla silky; segments 1 in. long, lanceclate. Stamens about 1 in. long. Pod 6-12 by 1-1·2 in., 8-12-seeded, flexible, reddish-brown or dusky-green, with darker blotches indicating the position of the seeds.

Occurs sporadically in Saháranpur and the Dún. Also in Jaunsab up to 5,000 ft.

Sapwood rather large, white; heartwood dark-brown with darker streaks, very hard, fairly durable, seasons well, and takes a fine poilsh; weight 54 lbs. per c. ft. It is used for wheels, oil-mills and furniture. The leaves and twigs are lopped for cattle-fodder.

Scarcely ever quite leafless. New leaves Mar., Apr. Fl. Apr.-June. Fr. Jan., Feb., but remains long on the tree.

A tree much resembling this species but differing from it in having fewer and larger leaflets and smaller panicles was considered, but not described, by Sir D. Brandis as a separate species under the name of A. Thomsonii. There are a few fruiting specimens in the College Herbarium from the Saháranpur Siwaliks, but none with flowers. The pod does not show any marked difference. Is it var. mollis, Benth.?

3. A. procera, Benth.; Fl. Br. Ind. ii. 299; Brandis For. Flora 175, Ind. Trees 271; Gamble Man. Ind. Timb. 305. Vern. Karha, Karhár, Karhái, Dún; Safed Siris or Siras, Hind.

A very large graceful tree with a deep oval crown when growing in the open; bark yellowish or greenish white, smooth, peeling off in thin flakes, often with horizontal lines. Leaf-rachises 10-15 in. long, glabrous or pubescent, with a large gland near the base;

pinns 3-5 pairs, 6-9 in. long. Leaflets 12-24 pn each pinna, 1-2 by '6-'9 in., shortly petioluled, obliquely oblong-ovate, glabrous; midrib diagonal and nearer the lower edge; lateral nerves rather prominent. Heads about '5 in. diam., 15-20-flowered, in fascicles of 2-5, arranged on large lax corymbosely branched terminal panicles which are 1-2 ft. long; peduncles '5-1 in., the lower from the axils of the upper leaves. Flowers yellowish-white, sessile, about '3 in. long. Calyx about '1 in. long, tubular, shortly toothed. Corolla '15 in. long, deeply cleft; segments oblong. Stamens a little more than twice the length of the corolla. Pod 4-6 by '6-'9 in., glabrous, brown, 8-12-seeded with darker blotches over the seeds.

Saháranpur and the Dún in mixed forests and generally in moist localities, e.g., Káluwála, banks of the Ré nadi, Khairi swamp, etc. Planted in avenues in Dehra.

Sapwood large, of a white colour, not durable. Heartwood light- or dark-brown, straight and even-grained, hard though rather porous, takes a fairly good polish, scason; well and is durable; weight 46 lbs. per c. ft. "It is largely used for sugarcane-orushers, rice-pounders, wheels, agricultural implements, bridges, and house-posts."—Sir D. Brandis. Its charcoal is considered very good. The bark is used for tanning, and is eaten mixed with flour in times of scarcity.

Fl. June-Aug. Fr. Cold season.

4. A. mollis, Boivin; Prain in Journ. As. Soc. Beng. Ixvi, Part ii, No. 2, 514. Gamble Man. Ind. Timb. 306. Syn.—A. Julibrissin, Boivin; Fl. Br. Ind. ii. 300; Brandis For. Flora 177, Ind. Trees 272. Vern. Bhondir, Kurmurá, Jaunsar.

A sparingly-branched moderate-sized deciduous tree; bark dark-grey, smooth, with long horizontal wrinkles. Leaf-rachises 6-12 in. long, bearing glands at the base and also between the upper pinnæ; pinnæ 6-12 pairs, 3-5 in. long. Leaftets 10-25 pairs, '5-'7 in. long by '15-'2 in. at the base, falcate, acute, very oblique, sensitive; midrib very close and paralled to the upper edge, which is quite straight. Peduncles 2-3 in. long, fascicled, corymbosely disposed at the axils of the fallen upper leaves. Flowers rose-coloured, 1-1'5 in. long, very shortly pedicelled. Calyx and corolla tubular, puebescent, the former '1 in., the latter '3 in. long and with lanceolate segments. Filaments 1 in. long, very slender, rose-coloured. Pod 3-5 by '6' '9 in., linear, thin, rather membranous, uniformly pale-brown or yellow, softly tomentose until mature, afterwards glabrous, 8-12-seeded.

JAUNSAR and TEHRI-GARHWAL, up to 5,000 ft. usually in open sunny ravines — Dharagadh; Mautargadh, etc.

Sapwood large; heartwood dark, almost black in old trees, hard, strong, and takes a good polish; weight about 47 lbs. per c. ft. It is used for furniture.

Fl. Apr.-June. Fr. Sept.-Nov., but remaining long on the tree.

5 A. stipulata, Boivin; Fl. Br. Ind. ii. 300; Brandis For. Folra 178, Ind. Trees 272, 709; Gamble Man. Ind. Timb. 306. Vern. Siran, Hind.

A large flat-topped tree of very rapid growth, remarkable for its large semi-cordate acute membranous pubescent stipules, whence the specific name; bark grey, with short vertical wrinkles crossed by deeper horizontal furrows. Leaf-rachises 7-12 in. long, bearing many glands; pinnæ 6-16 pairs, 4-6 in. long. Leaflets 20-40 pairs, 3-5 in. long by about 1 in. at the base, falcate, tapering to a sharp point from a broad base; midrib so close to the straight upper edge as to be hardly distinguishable from it. Heads in axillary panicled racemes. Flowers yellowish-white, slightly tinged with red. Calyx funnel-shaped, about 1 in. long, short-toothed, pubescent. Corolla twice the length of the calyx; segments ovate, pubescent. Stamens 1-13 in. long, very slender, red-tinged. Pod 4-5 by 5-7 in., thin, of a uniform light-brown colour, 8-10-seeded, often rugose over the seeds.

I quite follow Col. Prain in thinking that there are two distinct varieties of this species. The type with large stipules is found in Jaunsar and Tehri-Garhwal up to 4,000 ft., e.g., at Thadiár; and the other,—var. Smithiana, Roxb.,—with smaller stipules, is what is found near swamps in the Dún, e.g., Kálimatti, Káluwála, banks of the Ré nadi, Sidharwála, etc. Vern. Kaunerá, Garhwal: Bhandir, Hind.

Sapwood large, white; heartwood reddish-brown; weight varying from 25 to 45 lbs. per c. ft., the typical variety being probably the heavier of the two. The wood is likely to be found suitable for tea-boxes. The tree yields a gum which "is used by the Nepalese for sizing their Daphne paper."—Mr. J. S. Gamble. The branches are lopped for fodder.

New leaves Feb., Mar. Fl. Apr.-June. Fr. Autumn.

A. lucida, Benth., Fl. Br. Ind. ii. 299, is a graceful tree with dark-green foliage. It is not indigenous within the range of this flora, but deserves mention as it grows well under cultivation at Dehra, and is a good tree for avenues. It differs from all other species by having large penninerved acuminate leaflets, 3-5 in. long and 2-3 in. broad. Flowers sessile. Pod about 6 by 1 in., thin, flexible.

FAM. 34. ROSACEÆ; G. P. N. 58.

Herbs, shrubs or trees. Leaves stipulate, usually alternate, simple or compound. Flowers regular, 2-sexual. Calyx gamosepalous, superior or inferior. Disk annular or lining the base of the calyx-tube. Petals usually 5, imbricate. Stamens perigynous, usually indefinite, in one or many series, incurved in bud; anthers small. Ovary superior or inferior, of one or more free or connate carpels; styles as many as the carpels, free or connate. Fruit a pome, a drupe, or an aggregate of drupes achenes or follicles, rarely baccate or capsular. Seeds erect or pendulous, without albumen.

Analysis of the Genera.

Ripe carpels not enclosed within the calyx- tube, i.e., calyx always inferior. Leaves simple; carpel solitary; fruit a simple drupe.		
	1	PRUNUS.
Style basal; branches spinous		PRINSEPIA.
Leaves generally simple; carpels few;		
fruit an aggregate of follicles	3.	SPIRÆA.
Leaves generally compound; carpels	٠.	~
many; fruit an aggregate of drupes	4.	RUBUS.
Ripe carpels more or less enclosed within		
the calyx-tube, i.e., calyx at least ulti-		
mately superior.		
Stipules adnate to the petiole.		
(Fruit an aggregate of achenes enclosed		
	5.	Rosa.
Stipules free, deciduous.		
Fruit a pome; leaves simple, rarely		
pinnate	6.	Pyrus.
Fruit a drupe with 1-5 bony stones;		
leaves always simple.		
Leaves toothed or serrate	7.	Cratægus.
Leaves quite entire	8.	COTONEASTER.

1. Prunus, Linn.; G. P. n. 13.

Shrubs or trees. Leaves alternate, simple, usually serrate or crenate, convolute or conduplicate in bud; petiole often with 2 glands. Flowers white or red, solitary fascicled corymbose or racemed. Petals 5. Stamens many, perigynous, free. Carpel 1; style terminal; ovules 2, pendulous. Fruit a drupe, with a smooth or rugged 1-seeded stone.

Analysis of the species.

Flowers long-pedicelled in umbellate fascicles, appearing before the leaves . 1. P. Puddum.

Flowers short-pedicelled in long nodding racemes, appearing after the leaves . 2. P. Padus.

1. **P. Puddum**, Roxb.; Fl. Br. Ind. ii. 314; Brandis For. Flora 194, Ind. Trees 279; Gamble Man. Ind. Timb. 313. Vern. *Phájá*, Jaunsar; *Padam*, Hind.

A moderate-sized tree; bark brownish-grey, smooth, peeling off in thin shining horizontal strips. Leaves 3-5 by 1-1.5 in., ovate-lanceolate, long-acuminate, closely doubly-serrate, glabrous, shining, conduplicate in bud, appearing after the leaves; petiole about '5 in. long, with 2-4 glands at the base; stipules '6-'8 in. long, feathery and glandular. Flowers about '8 in. across, at first rose-coloured, fading to nearly white; peduncles '5-1.5 in., in umbellate fascicles. Calyx glabrous; tube '3-'4 in. long, funnel-shaped; lobes acute, entire. Petals about '5 in. long, obovate or oblong. Stigma 3-lobed. Fruit '5-'7 in., ovoid, obtuse at both ends, acid, yellow or red; stone rugose and furrowed.

JAUNSAR, TEHRI-GARHWAL and the OUTER HIMALAYA up to 8,000 ft., mostly in the outskirts of villages, apparently cultivated or run wild.—Korwá, Koti-Báwar, Bodyár; Málköt Forest, etc. Also cultivated in Dehra.

Heartwood reddish, moderately hard, strong, durable, with a pleasant smell; weight 40-45 lbs. per c. ft. The branches with the shining bark on are used for walking-sticks. The fruit is eaten, and the stones are strung up in rosaries and necklaces used by faqirs.

New leaves May, June. Fl. Apr., May, and sometimes also in autumn. Fr. Two months after flowering.

2. **P. Padus**, Linn.; Fl. Br. Ind. ii. 315; Brandis For. Flora 194, Ind. Trees 280; Gamble Man. Ind. Timb. 314. The Bird Cherry. Vern. Jámoi, Jámoi, Jámoi, Jaunsar.

A moderate-sized tree; bark rough, dark-grey or brown; young parts and inflorescence softly pubescent. Leaves 4-6 by 1-2.5 in., oblong elliptic or lanceolate, acuminate, closely serrate, often slightly cordate, conduplicate in bud, turning red before falling; lateral nerves 12-15 pairs, red and hairy at the axils underneath; midrib and petiole red, stout, the latter 1-1.5 in. long, with a pair of glands near the apex; bud-scales 1.5 by 25 in., reddish brown. Flowers 2-3 in. diam., white, in many-flowered nodding axillary and terminal racemes which are 4-6 in long; pedicels 25 in. Calyx turbinate, about 1 in. long. Petals white, 15 in. long, round, concave. Drupe acid, about 4 in. diam., globose, somewhat compressed, red when half ripe, almost black when fully ripe; stone rugged.

Common in Jaunsar and Tehri-Garhwal, 6,-9,000 ft.—Deoban, Konáin, Bhujköti, Mundáli; Deotá, etc., characteristic of grazing grounds. Scarce in the outer ranges.

Wood brownish-white, close and even-grained; weight about 40 lbs. per c. ft. It takes a fine polish, but is seldom used. The acid fruit is eaten by the hill people. The leaves are lopped for fodder.

New leaves Apr. Fl. Apr.-June. Fr. July-Oct.

To this Genus belong the following well-known fruit-trees, the cultivation of which is gradually extending in the Hills:—

- 1. P. persica, Benth. & Hook. f.; Fl. Br. Ind. ii. 313. The Peach. Vern. Arú, Hind. Leaves 3-5 by '7-1'3 in., oblong-lanceolate, serrate. Flowers about 1 in. across, pink, sessile. Fruit about 1.5 in. long; stone deeply furrowed. Now found in a semi-wild state in most parts of the Dún. Cultivated throughout the Hills.
- 2. P. armeniaca, Linn.: Fl. Br. Ind. ii. 313. The Apricot. Vern. Chúlú, Chilu, Hills; Zardálu, Hind. Leaves 2-3 5 in. diam., broad-ovate, acuminate, crenate; petiole 1-1 5 in. long, flexible, glandular. Flowers about 8 in. across, white or pinkish. Fruit about 1 in. long; stone smooth. Cultivated in the HILLS and also in Debra.

- 3. P. Cerasus, Linn.; Fl. Br. Ind. ii. 313.—The Cherry. Leaves 2-3 by 1-1'2 in., ovate, elliptic, abruptly acuminate, crenate, serrate. Flowers white, on long slender peduncles, in fascicles of 2-5. Drupe '4-'5 in. diam., globose, smooth and shining; stone round, smooth. Cultivated in the HILLS.
- 4. P. communis, Hudson; var. institia; Fl. Br. Ind. ii. 315. The Plum. Vern. Alúcha, Alú-bukhára, Hind. Leaves 3-4 in. long, ovate-lanceolate, serrate; nerves pubescent beneath. Flowers white or pink, on long slender peduncles. Drupe smooth, globose or oblong. Cultivated in the Hills, and some varieties are grown in Dehra and also in the Plains.

2. Prinsepia, Royle; G. P. n. 16.

1. **P. utilis,** Royle; Fl. Br. Ind. ii. 323; Brandis For. Flora 196, Ind. Trees 281; Gamble Man. Ind. Timb. 316. Vern. Bhekoi, Bhek, Jaunsar; Bhekal, Bhekar, Garhwal.

A dark-green spinous shrub; bark green on branches, brownish-white and peeling off in vertical strips on the main stem; spines often leaf-bearing. Leaves alternate, simple, 1.5-5 by 5-1.2 in., elliptic or narrow-lanceolate, acuminate, entire or sharply serrate, coriaceous dark-green, glabrous; petiole 2-5 in. long. Flowers white, 3-4 in. across, in short axillary racemes. Calyx cup-shaped, persistent. Petals 5, shortly clawed. Stamens numerous, in many series; filaments short; anther-cells separating by a broad connective. Carpel 1; style basal; ovules 2, pendulous. Drupe 5-7 in. long, obliquely obovate or oblong, with the remains of the style near the base, deep-purple and pruinose when ripe; kernel coriaceous, 1-seeded, smooth; cotyledons oily.

JAUNSAR 4, 8,000 ft.; common in sunny open places.—Saiá, Korwá, Matkángrá, Konáin, Koti-Báwar, etc.

Heartwood red, very hard, compact, but much liable to split; weight 69 lbs. per c. ft. An oil is expressed from the seeds, which is used chiefly for burning.

Fl. Apr. May. Fr. Rainy season.

3. Spiræa, Linn.; G. P. n. 8.

Perennial herbs or shrubs. Leaves alternate, simple or compound. Flowers white or red, in axillary or terminal cymes. Calyx persistent; lobes 4-5. Petals

as many as the calyx-lobes. Stamens many; filaments free or connate below. Disk fleshy. Carpels 5 or more, free or connate below; ovules 2 or more, pendulous. Fruit an aggregate of 5 or more follicular carpels.

Analysis of the Species.

Leaves pinnate; carpels connate below . 1. S. sorbifolia.

Leaves simple; carpels quite free.
Branches slender; leaves glaucous be-

neath; flowers dimorphous . . 2. S. bella.

Branches stout; leaves pale beneath;

flowers not dimorphous . 3. 8. canescens.

1. S.-serbifelia: Linn; Fl. Br. Ind. ii. 324; Brandis Ind. Trees 283; Gamble Man. Ind. Timb. 316. Vern. Latkár, Lotkár; Jaunsar.

A tall shrub; bark reddish-grey. Leaves imparipinnate, less frequently paripinnate, 8-12 in. long; rachis terete. Leaflets 6-19 pairs, sessile, 3-5 by '7-1 in., linear-lanceolate, rounded at the base, long acuminate, doubly serrate, glabrous or hairy beneath; midrib stout; lateral nerves numerous, straight; stipules linear-subulate, '25 in. long. Flowers white, '25 in. diam., in many-flowered cymes which are disposed in large thyrsoid much-branched terminal panicles 1-15 ft. long. Calyx-tube hemispherical; lobes rounded. Petals orbicular. Carpels 5, connate below, separating and dehiscing dorsally in fruit.

JAUNSAR and TEHRI-GARHWAL, 7,-9,000 ft.; common at Konáin. Also found at Mundáli; Deotá, etc.

Wood hard, compact, even-grained; weight 49 lbs. per c. ft. Fl. May, June. Fr. June, July.

 S. bella, Sims.; Fl. Br. Ind. ii. 324; Brandis Ind. Trees 283.

A small shrub 2-6 ft. high. Leaves simple, very variable in size and shape, '5-2 in. long, broadly oblong ovate or ovate-lanceolate, obtusely inciso-serrate throughout or towards the apex only, membranous, dark-green above, glaucous beneath. Flowers generally pink, dimorphous and subdicecious, in corymbosely much-branched cymes. Calyx-tube villous within; lobes acute. Petals orbicular.

Stamens deformed in the female flowers, long in the male. Style long in the female flowers, short in the male. Ripe carpels dark-brown, shining.

Tehri-Garhwal, e.g., Deotá, etc.; not very common.

Fl. Apr., May. Fr. Oct., Nov.

3, S. canescens, Don; Fl. Br. Ind. ii. 325; Brandis Ind. Trees 283; Gamble Man. Ind. Timb. 317. Vern. Tákoi, Chakroi, Jaunsar.

A stiff small shrub; branches striate, grey-canescent, arching. Leaves simple, '4-'8 by '3-'5 in., obovate, entire or toothed towards the apex on luxuriant shoots, subcoriaceous, pale-green beneath; lateral nerves 2-4 pairs; petiole up to '15 in. Flowers hermaphrodite, bracteate, white or pale-pink, '2 in. diam., in small dense compound corymbs at the ends of all the branches and branchlets. Stamens not longer than the petals. Ripe carpels villous, partially sunk in the calvx-tube.

JAUNSAR and TEHRI-GARHWAL, above 7,000 ft., chiefly on open hill-sides. Quite common.

Wood fairly hard, even- and close-grained; weight 47 lbs. per c. ft. Light walking-sticks are made of the branches.

Fl. May-July. Fr. Autumn.

S. vaccinifolia, Don.; Fl. Br. Ind. ii. 325; occurs in the Hills below 7,000 ft.—Bámsu Valley, valleys below Konáin, Málköt, etc. It is very similar in appearance to S. bella, but is more gregarious in habit, and the flowers are hermaphrodite and white.

4. Rubus, Linn.; G. P. n. 36.

The Brambles.

ly trailing shrubs, almost always prickly. Leaves (on the local species) generally compound; stipules more or less adnate to the petiole. Flowers white or red, in terminal or axillary corymbose panicles, rarely solitary. Calyx 5-lobed, persistent. Petals 5. Stamens numerous. Carpels many, distinct, on a convex receptacle; style subterminal. Fruit of many 1-seeded drupes crowded on the receptacle which becomes conical in the fruit.

Analysis of the Species.

Leaves simple; petals white; fruit black . 1. R. paniculatus. Leaves pinnately 3- rarely 5-foliolate. Petals pink; fruit red, generally dry 2. R. niveus. Petals white : fruit yellow, succulent. Leaflets grabrous 3. R. macilentus. Leaflets tomentose or pubescent beneath. Stem bristly: flowers in denseflowered terminal panicles 4. R. ellipticus. Stem quite glabrous, pruinose: flowers in 1-3-flowered axillary peduncles 5. R. biflorus. Leaves pinnately 5-11-foliolate; petals 6. R. lasiocarpus. pink: fruit black .

1. R. paniculatus, Smith; Fl. Br. Ind. ii. 329; Brandis For. Flora 196, Ind. Trees 283; Gamble Man. Ind. Timb. 318. Vern. Pándroi, Kálá Ánchhu, Jaunsar.

A large rambling shrub; all parts except the upper surface of the leaves clothed with soft white cottony tomentum; prickles few, minute. Leaves 3-6 by 2.5-3.5 in., ovate, cordate, long-acuminate, obscurely lobed, irregularly serrate, 3-5-nerved at the base; lateral nerves about 8 pairs; petiole 1-2 in. long. Flowers 7-1 in. diam., in much-branched lax terminal panicles which are 4-12 in. long; pedicels 5-1 in. long. Calyx-lobes ovate-lanceolate, often caudate-acuminate, erect in fruit. Petals 2-3 in. long, much shorter than the calyx-lobes. Carpels glabrous. Fruit 5-7 long, conical, black; drupes large; receptacle villous.

JAUNSAR and TEHRI-GARHWAL, up to 6,000 ft. Generally in damp shady zavines: Korwá, Dhárágádh, Bagúr Block, Kōti, Tons Valley, etc.

The fruit is good to eat.

Fl. Apr.-June. Fr. June, July.

2. R. niveus, Wall.; Fl. Br. Ind. ii. 335; Brandis Fór. Flora 199; Gamble Man. Ind. Timb. 317. Vern. Bheré, Bherá, Bheáré, Jaunsar.

A very variable shrub, rambling or suberect; branches usually glabrous. Leaves pinnately 3-foliolate, rarely 5-foliolate, 3-6 in. long; petiole with several prickles beneath. Leaflets 1-4 by 3-3 in., ovate or elliptic, often cordate, lobed or incised, generally doubly

serrate, membranous. Flowers '3-'7 in, diam., axillary or in few-flowered corymbose terminal cymes; pedicels '2-'8 in. long. Calyx-segments '3-'4 in. long, ovate-lanceolate, pubescent, spreading or reflexed in fruit. Petals pink, '2-'3 in diam., broad-ovate, much smaller than the calyx-lobes, erect, concealing the stamens. Stamens very numerous. Fruit globose; drupes many, dry, not edible,—less frequently few, fleshy, very acid.

Gregarious in JAUNSAR and TEHRI-GARHWAL, 7,-10,000 ft.; extremely common.

It interferes with the reproduction of tree species on shady northern aspects as in the Mundáli Forest, but in other places is useful as a shade-giver to young plants of delicate species,

Fl. Apr. May. Fr. May, June.

3. R. macilentus, Camb.; Fl. Br. Ind. ii. 336; Brandis For. Flora 199, Ind. Trees 286.

A trailing shrub, deep-green all over; stem nearly glabrous, shining; prickles flattened. Leaves pinnately 3-foliolate; rachis 3-4 in. long. Leaflets 5-2·5 in. long, ovate or ovate-lanceolate, doubly crenate-toothed, subcoriaceous, glabrous, prickly along the midrib,—the lateral very variable in size and shape. Flowers '3-'6 in. across; peduncles '2-'8 in. long, pubescent, generally 1-flowered, axillary and terminal. Calyx-lobes caudate, erect in fruit, silky outside, tomentose within. Petals white, broad-obovate, clawed, exceeding the sepals. Fruit globose, yellow or deep-orange; drupes few, glabrous, juicy; receptac belongated, pubescent.

Common in JAUNSAR and TEHRI-GABHWAL, up to 8,000 ft.—Chakrata, Jádi, Konáin, Mundáli; Deota, etc.

The fruit is eaten.

Fl. Apr., May. Fr. June, July.

4, **R. ellipticus**, Sm.; Fl. Br. Ind, ii. 336. Brandis Ind. Trees 286; Gamble Man. Ind. Timb. 317. Syn.—R. flavus, Ham.; Brandis For. Flora 197, Vern, Hinsáu, Jaunsar; Hinsar, Garhwal; Ánchhu, Lál Ánchhu, Hind,

A large shrub; branches stout, shaggy with long reddish bristles, often also with glandular hairs; prickles sharp, Leaves pinnately 3-foliolate, the lower ones sometimes 1-foliolate; rachis 1-3 in. long. Leaflets 2-4 in. long, obovate elliptic or orbicular, closely serrate, dark-green above, pale-green and usually tomentose beneath. Flowers 3-6 in. across. Calyx-segments ovate, erect in fruit. Petals white, obovate, exceeding the calyx-segments. Fruit 4-8 in, diam., yellow; drupes small, crowded; receptacle cylindrical, hairy.

JAUNSAR and TEHRI-GARHWAL, 3,-5,000 ft.; common on open hill-sides and round villages: Saiá, Binálgádh, Dhárágádh, Köti Báwar, Tons Valley, etc. Also OUTER HAIMLAYA and the Dún; —Málköt, Tháno, Ráipur, etc.

The fruit has an agreeable flavour, and is greedily eaten wherever the plant grows.

Fl. Feb., Mar. Fr. Apr., May.

5. **R. biflorus**, Ham.; Fl. Br. Ind. ii. 338, R. biflorus, Buch.; Brandis For. Flora 198, Ind. Trees 286; Gamble Man. Ind. Timb. 317. Vern Achhoi, Jaunsar.

A large spreading shrub; branches glabrous, white with a glaucous bloom; prickles sharp and strong. Leaves usually 3-foliolate, sometimes 5-foliolate, rarely 1-foliolate and 3-lobed; petiole 1-2 in., pubescent, prickly. Leaflets 2-3-5 in. long, ovate-lanceolate, often obscurely lobed, irregularly doubly-serrate or toothed, hairy above, white and densely tomentose beneath. Flowers '5-'7 in. diam.; peduncles axillary, slender, drooping, '5-1-5 in. long, 1-3-flowered. Calyx-lobes ovate-lanceolate, mucronate. Petals white, orbicular, equal to, or exceeding, the calyx-lobes. Fruit '6-'7 in. diam., globose, yellow; drupes 20-30, juicy; receptacle elongated, villous.

JAUNSAR, up to 8,000 ft.: Bodyár, Kathián, Dhárágádh, etc. Less common than any of the preceding species.

The fruit has a sweetish taste and is eaten.

Fl. Apr., May. Fr. May, June.

6. R. lasiocarpus, Sm.; Fl. Br. Ind. ii. 339; Brandis For. Flora 198, Ind. Trees 286; Gamble Man. Ind. Timb. 317. Vern. Bheré, Kálá Hinsálu, Jaunsar; Káli Ánchhi, Dún.

A spreading shrub, often gregarious; branches long, thickly pruinose, purple below the bloom, quite glabrous. Leaves 5-7-9-11-K foliolate, 3-10 in. long. Leaflets 1-3 in. long, ovate elliptic or ovate-lanceolate, acutely toothed or serrate, subcoriaceous, glabrous or silky above, thickly white-tomentose beneath, terminal often lobéd; lateral nerves close, straight, very strong beneath. Flowers 3-7 in. diam., in terminal and axillary simple or panicled lax corymbs; peduncles 1-2 in. long; pedicels of various lengths. Calyx densely woolly; lobes ovate or ovate-lanceolate. Petals red, round or obovate, usually shorter than the calyx-lobes. Fruit 3-5 in. diam., black when fully ripe, dry or fleshy; drupes numerous; receptacle villous.

Fairly common in the Dún and the Outer Himalaya: Karwápáni, Rámgarh, Tháno, Málköt, etc. Also found in Jaunsae up to 7,000 ft., e.g., Lúrli forest, Kathián, etc. The fruit has a good flavour and is eaten.

Fl. Apr., May in the Hills; Feb., Mar. in the Dun. Fr. About two months after flowering.

5. Rosa, Linn.; G. P. n. 60.

Erect scrambling or climbing shrubs, more or less prickly. Leaves alternate, imparipinnate; leaflets serrate; stipules more or less adnate to the petiole. Inflorescence various. Flowers white yellow or pink. Calyx-tube globose ovoid or pitcher-shaped; mouth contracted; segments foliaceous. Disk coating the calyx-tube, silky. Petals 5, rarely 4. Stamens numerous, inserted on the edge of the disk. Carpels 1-ovuled, hairy, usually many, enclosed in the calyx-tube; styles free or connate above the neck of the calyx-tube; stigma thickened; ovule pendulous. Fruit an aggregate of 1-seeded dry hairy achenes enclosed in the fleshy calyx-tube.

Analysis of the Species.

Suberect shrubs. Styles distinct; sepals
persistent in fruit.

Leaflets serrate nearly down to the base;
flowers bracteate; petals 5 . 1. R. macrophylla.

Leaflets toothed only in the upper half;
flowers ebracteate; petals usually 4.

A large climber. Styles united into an ex-

1. **R. macrophylla**, Lindl.; Fl. Br. Ind. ii. 366; Brandis For. Flora 203, Ind. Trees 288; Gamble Man. Ind. Timb. 319. Vern. *Bháunrá Kujoi*, Jaunsar.

serted column; sepals deciduous in fruit 3. R. moschata.

An erect shrub, 6-10 ft. high, with smooth green branches; bark of stem dark-brown, peeling off in thick flakes; prickles more or less straight, often 0. Leaves 3-8 in. long; petiole pubescent, slightly channelled above; stipules '4-'6 in. long, spreading, ciliate with

glands. Leaflets 7-11, '5-2'5 by '3-1'3 in., gradually smaller from the terminal downwards, elliptic, usually grey-pubescent beneath, minutely petioluled. Flowers 1-2'5 in. diam., bright-red or pink, solitary or in few-flowered subterminal corymbs; pedicels '5-15 in. long, studded with glandular bristles. Bracts 1-1'5 in. long, lanceolate, leaf-like, glandular on the margins. Calyx with glandular bristles outside; lobes much elongated, filiform in the middle, dilated and leafy above, persistent in fruit. Petals 5, broadly obcordate. Styles hairy, exerted. Fruit 1-2 in. long, turbinate.

Common in the Hills, 7,-10,000 ft.; almost gregarious in some forests, e.g., Mohná Block, Mundáli, Konáin, Deotá, etc., where it often interferes with the natural reproduction of tree species.

Wood hard, compact, weighing 55-60 lbs. per c. ft. It makes good hedges. The fruit is eaten when ripe.

Fl. May, June. Fr. July, Aug.

Var. minor, Lindl.—has leaflets up to '5 in. long and somewhat smaller flowers.

2. R. sericea, Lindl.; Fl. Br. Ind. ii. 367; Brandis For. Flora 202, Ind. Trees 288; Gamble Man. Ind. Timb. 319,

A suberect thorny shrub, 4-8 ft. high; bark greyish brown, peeling off in papery flakes; prickles nearly straight, brown. Leaves 1-3 in. long; stipules oblong, spreading, membranous. Leaflets 7-11, 25-1 in. long, oblong or obovate-oblong, dentate or coarsely serrate in the upper half, glabrous above, silky along the nerves beneath. Flowers 1.5-2.5 in. diam., solitary, white or pink; peduncle and calyx-tube glabrous; bracts 0. Calyx-lobes lanceolate, pubescent, persistent in fruit. Petals usually 4, 6-1.2 in. long, obcordate, pure white or with a shade of pink. Fruit pyriform, searlet.

Tehri-Garhwal, above 9,000 ft.: Deotá (Rikshin), Bálchá, Harki-Dún, etc. Likely also to occur at higher elevations in Jaunsar.

Fl. May-July.

3. R. moschata, Mill.; Fl. Br. Ind. ii. 367; Brandis For. Flora 201, Ind. Trees 288; Gamble Man. Ind. Timb. 318. Vern. Kújoi, Jaunsar; Kúnjo, Garhwal.

A large thorny climbing shrub; bark greyish-brown; prickles stout, recurved. Leaves 2-6 in. long; petiole pubescent, slightly channelled, with scattered prickles beneath; stipules about 1 in. long, membranous, with a spreading tip and a few glandular hairs along the margins. Leaflets 5-9,1-3 by 4-13 in., ovate ovate-lanceolate or elliptic, acuminate, very regularly closely serrate, finely grey-

pubescent beneath, lateral subsessile. Flowers sweet-scented, 1.5.2 in. diam., in large terminal corymbose racemes; pedicels 1-1.5 in. long, slender, grey-pubsecent and also with a few scattered red glands. Calyx-lobes about 1 in. long, narrow-lanceolate, often with 1-2 pairs of foliaceous appendages at the margins, deciduous in fruit. Petals 5, pure white, obovate, generally with a distinct tip. Stamens yellow, much shorter than the petals. Styles exserted, united into a hairy column above the neck of the calyx-tube. Fruit 3-4 in. long, obovid, dark-brown.

Common in Jaunsab and Tehri-Garhwal, 3,000 to 8,000 ft. also in the Outer Himalaya, generally along streams or in open ravines: Korwá, Konáin, Dhárágádh, Kathián, Tons Valley; Láduaköt, etc.

Often injures forest trees by spreading over their crowns. An excellent otto is extracted from the flowers at Náhan in Sirmoor.

Fl. May, June. Fr. June, July.

6. Pyrus, Linn.; G. P. n. 63.

Trees or shrubs. Leaves alternate, generally simple. rarely pinnate; stipules deciduous. Flowers white or pink, in terminal corymbs. Calyx-tube urceolate or turbinate; lobes erect or reflexed, persistent or deciduous. Petals 5. Stamens many; filaments sometimes connate at the base. Carpels 2-5, adnate to the calyx-tube; ovules usually 2 in each carpel; styles 2-5. free or connate below. Fruit a pome, 2-5-celled, more or less fleshy.

Analysis of the Species.

V 1. **P. Pashia**, Ham.; Fl. Br. Ind. il. 374; Brandis For. Flora 575, Ind. Trees 291; Gamble Man. Ind. Timb. 322. Syn.—P. variolosa, Wall. Brandis For. Flora 204. Vern. Káint, Káenth, Jaunsar; Mohál, Mehál, Meyel, Mahol, Dún and Garhwal.

A moderate-sized deciduous tree; bark on old stems almost black, both longitudinally and transversely split into small thick rectangular scales, on branches dark-brown smooth and with small white lenticel-dots. Leaves simple, very variable in size and shape. generally 2-4 by '7-1'5 in., ovate or ovate-lanceolate, long-acuminate. closely serrate or crenate, glabrous, shining, lobed and often woolly beneath on young plants; lateral nerves 8-10 pairs, very slender, more prominent above than beneath; petiole 3-15 in long, slender, often reddish; stipules '5 in. long, setaceous, early deciduous. Inflorescence a corvmb or an umbel .- or the flowers are fascicled at the ends of short branchlets,—appearing shortly before the leaves; pedicels 5-2 in, long, thickened in fruit. Flowers white, about 1 in. across. Calyx-tube urceolate; lobes spreading, white-woolly. Petals obovate, with dark radiating veins. Stamens 25-30. Styles 3-5. woolly. Fruit globose. '7-1'5 in. diam., dark-brown, covered with raised white dots.

Common in Jaunsar and Tehri-Garhwal up to 7,500 ft.: Chakrata, Koti-Kanásar, Konáin, Dhárágádh, Kathián, etc. Also found in the Outer Himalaya and in certain localities in the Dún: Málköt, Paléd, Tháno, Mothronwála, Bindál-nálá near Dehra, etc.

Wood brown, compact, fine-grained, hard and durable, but liable to split and warp in seasoning; weight 47 lbs. per c. ft. It is used for walking-sticks, combs, tobacco-pipes and such other purposes. The fruit is eaten when half-rotten. The leaves and twigs are lopped for fodder.

New leaves and flowers Mar., Apr. in the hills, and about a month earlier in the Dún. Fr. Sept.-Dec.

2. P. lanata, Don; Fl. Br. Ind. ii. 375; Gamble Man. Ind. Timb. 323; Brandis Ind. Trees 291; Syn.—P. Aria, Ehrh.; Brandis For. Flora 206. Vern. Pái, Páhi, Jaunsar.

A moderate-sized deciduous tree; bark dark-brown with shallow longitudinal furrows. Leaves simple, 5-8 by 2-4 in., broadly oblong or obvate, acute, lobulate, finely serrate, white-woolly beneath, glabrescent above; lateral nerves 8-12 pairs, nearly straight, very prominent beneath; base rounded or acute; petiole *5-1 in. long. Flowers white, *4-6 in. diam., in short hemispherical corymbs, 3-5 in. across; pedicels short, woolly. Calyx turbinate; lobes ovate, acute. Petals obovate-oblanceolate, shortly clawed. Stamens 20. Styles 2-3, villous. Fruit '5-1 in. long, pyriform and 1-2 seeded (in the region of this Flora).

JAUNGAR and TEHRI-GARHWAL, above 8,000 ft., characteristic of the high-level grazing grounds. Konáin, Mundáli; Dectá, Bálchá, etc.

Wood close- and even-grained, "might be used for boxes and other purposes."—Mr. J. S. Gamble. Weight 40-47 lbs. per c. ft. The fruit is eaten when half-rotten.

Fl. Apr., May. Fr. Aug.-Oct.

3. P. foliolosa, Wall.; Fl. Br. Ind. ii. 376; Gamble Man. Ind. Timb. 323; Brandis Ind. Trees 292. Syn.—P. ursina, Wall.; Brandis For. Flora 206.

A shrub or small tree; bark reddish-grey, peeling off in horizontal papery strips. Leaves imparipinnate, 4-6 in. long, rusty-tomentose at first, glabrate afterwards. Leaflets 9-15 pairs, opposite, sessile, 1-15 in. long, the middle ones longer than the others, linear-oblong, acute or obtuse, cuspidate-serrate. Flowers greenish-white, 3-5 in. diam., in compound terminal and axillary corymbs; pedicels short, glabrous; bracts rusty-hairy. Calyx cup-shaped, glabrous; segments triangular. Petals orbicular-ovate, rusty-villous. Styles thick, short. Fruit 3-5 in. diam., ovoid or globose, bluish-red when ripe.

Jaunsar and Tehri-Garhwal, above 7,000 ft. Fl. June, July. Fr. Sept., Oct.

Two well-known fruit trees belong to this Genus:-

- 1. P. Malus, Linn.; Fl. Br. Ind. ii. 373. The Apple tree. Vern. Sew, Hind. Leaves 2-3 in. long, ovate, glabrous above, tomentose beneath, acuminate, crenate, long-petioled. Flowers pink-tinged, 1 in. diam. Calyx-lobes persistent. Petals clawed. Pome 2-3 in. diam., globose, intruded at both ends; seeds brown, lenticular. Cultivated at Chakrata. Fl. Mar.-May. Fr. Dec., Jan.
- 2. P. communis, Linn.; Fl. Br. Ind. ii. 374. The Pear tree. Vern. Náshpáti, Hind. Leaves variable in size, oblong or ovate, active, entire or slightly crenulate; petiole slender, very long. Flowers white, 1 in. diam. Calyx-lobes persistent. Petals obovate. Pome 1-2 in. diam. pyriform or sub-globose, intruded at the apex. Much cultivated in Dehra. Fl. Mar., Apr. Fr. July-Sept.

7. Cratægus, Linn.; G. P. n. 64.

- 1. C. crenulata, Roxb.; Fl. Br. Ind. ii. 384; Gamble Man. Ind. Timb. 325; Brandis Ind. Trees 294. Syn.—O. Pyracantha, Pers.; Brandis For. Flora 208. Vern. Gingéru, Jaunsar.
- A large rigid spinescent evergreen shrub. Leaves alternate, simple, generally crowded on short lateral branchlets, 1-2.5 by '2.5

in., linear-oblong or oblance olate, obtuse, very coriaceous, crenulate, glabrous, shining above; lateral nerves close, parallel, indistinct; petiole very short, margined; stipules deciduous. Flowers white, 2:3 in. diam., in terminal corymbose cymes; pedicels slender; bracts caducous. Calyx-tube hemispherical; lobes obtuse. Petals orbicular, very shortly clawed, inserted at the mouth of the calyx-tube. Stamens many. Carpels 5; connate below; ovules 2 in each cell, ascending. Fruit a dry globose drupe, 2:3 in. diam., orange or red when ripe.

JAUNSAR and TEHRI-GARHWAL, ascending to 6,500 ft. generally along streams in open valleys: Korwá Forest, Binalgádh, Dhárágádh, Tons Valley, etc. Also along Sub-Himalayan mountain streams in the Dún, e.g., Bidhálna Ráu and Birdál-nálá.

Wood white, hard, very close- and even-grained; weight 48 lbs. per c.ft. The branches are made into walking-sticks and khudsticks in the hills.

Fl. Apr., May. Fr. July, Aug.

8. Cotoneaster, Linn.; G. P. n. 65.

Shrubs or small trees. Leaves alternate, simple, entire, usually downy beneath; stipules deciduous. Flowers middle-sized, white or pink, solitary or in axillary or terminal corymbose cymes. Calyx-tube turbinate; segments 5, short, persistent. Petals 5. Stamens many, inserted at the mouth of the calyx-tube. Carpels 2-5, more or less adnate to the calyx-tube; ovules 2 in each cell, erect; styles 2-5, free. Fruit small, with 2-5 bony 1-seeded stones.

Analysis of the Species.

Erect shrubs. Leaves deciduous.

Flowers in many-flowered terminal cymes. 1. C. bacillaris.

Flowers in few flowered axillary cymes or solitary 2. C. acuminata.

A prostrate shrub. Leaves persistent 3. C, microphylla.

1. C. bacillaris, Wall.; Fl. Br. Ind. ii. 384; Brandis For. Flora 208, Ind. Trees 294; Gamble Man. Ind. Timb. 326. Vern. Raunsh, Ruinsh, Leonsh, Jaunsar.

A very variable shrub, usually 10-18 ft. high, but under favourable circumstances a small tree attaining a considerable girth (e. g., 9 ft. 6 in, at Bálchá)*; crown spreading; bark bluish-grey, almost smooth, marked with short transverse white bars. Leaves 1-3·5 by 7-1·7 in., ovate ovate-oblong obovate or lanceolate, rather membranous, finely pubescent or glabrescent and pale beneath, often minutely mucronate; midrib very prominent beneath, depressed above; main lateral nerves 6-10 pairs; base acute; petiole 2-4 in.; stipules 2-3 in. long, subulate, early caducous. Flowers white, 25-3 in. across, in spreading compound cymes at the end of short leaf-bearing branchlets; minute or 0. Frait 2-5 in. diam., globose, 2-celled, in spreading bunches, dark-brown when ripe.

JAUNSAR and TEHRI-GARHWAL, 4,-8,500 ft.: Deothát, Bodyár, Konáin, Mundáli; Deotá, Lambátách, Bálchá, etc. Generally in open ravines and on grassy hill-sides.

Wood brownish-white, very hard, tough, close and evengrained; annual rings distinct; weight 57 lbs. per c. ft. The branches are much sought after for making walking-sticks; indeed no tree of any size is ever found which has not been repeatedly mutilated.

C. rosea, Edgew. is relegated under var. affinis of the above species in the Fl. Br. Ind. It is a much smaller shrub, and the smaller pink flowers open later. Found by Mr. Dutlie near the Deotá temple, Tehri-Garhwal, and by myself at Bájámárá, Jaunsar, and at Kulni, Tehri-Garhwal.

Fl. Apr.-June. Fr. June, July.

2. **C. acuminata**, Lindl.; Fl. Br. Ind. ii. 385; Brandis For. Flora 209, Ind. Trees 295; Gamble Man. Ind. Timb. 326. Vern. Leonshi, Raunshi, Ruinshi, Jaunsar.

A shrub smaller than the last, never with a spreading crown; bark dark bluish-grey, shining. Leaves 1-2.5 by 4-8 in., ovate-lanceolate or elliptic, acuminate, silky-pubescent beneath; margins usually ciliate with silky hairs. Flowers white, 3-4 in. diam., solitary or in few-flowered axillary and subterminal cymes. Culyx turbinate, reddish-brown inside. Fruit 3 in. long, turbinate, red when ripe.

[.] Measured 3rd June 1900.

JAUNSAB, 8,-10,000 ft.; common at Deoban, less so at Konáin and Mundáli.

Wood as of the last species. The branches are made into walking-sticks, but pieces of sufficient thickness are rather rare.

Fl. May, June. Fr. June, July.

3. C. microphylla, Wall.; Fl. Br. Ind. ii. 387; Brandis For. Flora 209, Ind. Trees 295; Gamble Man. Ind. Timb. 327. Vern. Bheddá, Jaunsar.

A small much branched prostrate evergreen shrub; bark darkgrey, almost black. Leaves 3.5 by 2.35 in., ovate obovate or elliptic, acute obtuse or retuse, coriaceous, dark-green and glossy above, pubescent or pilose beneath, minutely petioled; margins recurved, more or less ciliate when young. Flowers white, 4.5 in diam, axillary, solitary. Fruit 3.4 in. long, globose or obovoid, finely pubescent, scarlet when ripe.

Common in Jaunsar and Tehri-Garhwal, between 6,500 and 10,000 ft., trailing on rocks or spreading on grassy hill-sides. The branches are used in Kashmir for making baskets. The ripe fruit is sweet.

Fl. Apr.-June. Fr. July, Aug.

Very similar in appearance are C. thymifolia, Hort., and C. buxifolia, Wall., Fl. Br. Ind. ii. 387, differing chiefly in the flowers being generally cymose. Both are likely to occur in the same localities, especially in the inner ranges.

Mr. Gamble thinks that C. multiflora, Bunge, and C. nummularia, Fisch., Fl. Br. Ind. ii. 386, also occur above 10,000 ft. These are bushy plants generally with small leaves. The former is somewhat larger than the other, and has, as the specific name implies, more-flowered cymbs. The latter has orbicular leaves, whence its specific name.

Potentilla fruticosa, Linn., Fl. Br. Ind. ii. 347,—is a low undershrub found near Panc'áwa in Jaunsar and at Rikhshin and Mor'ru in Tehri-Garhwal. Leaves usually 3-foliolate; leaflets '4.'7 in. long, lanceolate. Flowers solitary, diceoious. Fruit of hairy ac lenes.—G. P. n. 48.

Eriobotrya japonica, Lindl., Fl. Br. Ind. ii 372; the Loquat. Vern. Loká', Lukái, Hind.—is another well-known fruit tree of this Famil. Leaves subsessile, 6-10 in. long, oblanceolate, acuminate, distantly ser ate, hard, coriaceous, densely woolly and strongly nerved beneath. Flowers dull-white, fragrant, in terminal panicles. Fruit

pyriform or globose, baccate, 1.5-2 in. long, yellow or orange when ripe; seeds 2-5, dark-brown, smooth. Much cultivated at Dehra and Saháranfur. Fl. Nov., Dec. Fr. Mar., Apr.—G. P. n. 66.

FAM. 35. SAXIFRAGACEÆ; G. P. N. 59.

Herbs, less frequently shrubs or trees. Leaves opposite or alternate, simple, usually exstipulate. Flowers regular, generally 2-sexual. Calyx more or less adnate to the ovary, rarely quite free. Petals 5, sometimes o, rarely 0. Stamens free, as many as the petals or twice their number, exceptionally numerous. Disk annular or glandular. Ovary of 2 or 3-5 carpels and as many cells, rarely 1-celled; styles as many as the carpels, free or united; ovules many; placentation axile (parietal in 1-celled 4varies). Fruit a berry or capsule, or composed of follicles. Seeds usually many, albuminous.

Analysis of the Genera.

Leaves opposite; stamens not fewer than 8.

Stamens 8 or 10.

Flowers polygamous; stamens linear 1. HYDRANGEA.

Flowers 2-sexual; stamens winged.
Stamens 20-40.

. 2. DEUTZIA.
3. PHILADELPHUS.

Lvs. alternate; stamens not more than 5. Ovary almost wholly superior; fruit a capsule

4. ITEA.

Ovary wholly inferior; fruit a berry . 5. RIBES.

1. Hydrangea, Linn.; G. P. n. 22.

H. altissima, Wall.; Fl. Br. Ind. ii. 404; Brandis For. Flora 211, Ind. Trees 297; Gamble Man. Ind. Timb. 328. Vern. Kathmorá, Garhwal.

A large climbing shrub; bark cinnamon-colour, shining, membranous, loose, peeling off in long papery rolls. Leaves 3-6 in. long.

ovate- or ovate-lanceolate, acuminate, sometimes cordate, entire or more or less dentate, membranous; main lateral nerves 6-8 pairs; petiole 1-2 in. long. Flowers cream-colour, polygamous, very small if fertile, enlarged to about 1 in. diam., and apetalous if sterile. Calyx-tube adnate to the ovary; limb 4-5-fid; segments of sterile flowers, '2-5 in. long, spreading. Petals (if present) 4-5, valvate, falling off in a cap. Stamens 10; filaments filiform. Ovary inferior, styles 2-4. Fruit a membranous capsule.

JAUNSAR and TEHRI-GARHWAL, in shady ravines up to 7,000 ft.: Bámsu, Lambátách, Kulni, etc.; Bear Garden, Chakrata.

The bark is used as a substitute for paper.

2. Deutzia, Thunb.; G. P. n. 27.

Shrubs with opposite branches. Leaves opposite, stellate-pubescent, exstipulate, serrate. Flowers white, more or less corymbose. Calyx adnate to the ovary; teeth 5, small. Petals 5. Stamens 10, alternately longer; filaments winged. Ovary 3-5-celled; styles 3-5. Fruit a 3-5-celled capsule, dehiscing septicidally.

Analysis of the Species.

Bark peeling off in papery rolls; leaves green beneath; petals imbricate. 1. D. corymbosa. Bark peeling off in thin longitudinal strips;

leaves pale beneath; petals induplicate-

2. D. staminea.

1. **D. corymbosa**, Br.; Fl. Br. Ind. ii. 406; Brandis For. Flora 212, Ind. Trees 296; Gamble Man. Ind. Timb. 329. Vern. *Bhújroi*, Jaunsar.

A shrub, 4-8 ft. high; bark light einnamon-colour, peeling off in thin papery rolls, inner layer white. Leaves 1:5:3:5 by 7:1:5 in., ovate-lanceolate, long-acuminate, closely serrate, membranous, with scattered stellate hairs beneath; petiole short. Flowers white, fragrant. 5-7 in. diam., in trichotomously corymbose terminal panicles; bracts small, deciduous; pedicels 2-3 in. long. Calyateeth shorter than the tube, spreading. Petals obovate or rounded, generally glabrous. Styles usually 3. Capsule 2 in. diam., hemispherical, truncate.

Common in JAUNSAR and TEHEI-GARHWAL, above 6,000 ft., usually affecting shady ravines.

Wood white, soft, even-grained; weight 46 lbs. per c. ft.

Fl. May, June.

√2. **D. staminea**, Br.; Fl. Br. Ind. ii. 407; Brandis For. Flora 212, Ind. Trees 296; Gamble Man. Ind. Timb. 329. Vern. Ghúqtai, Dáhlochi, Jaunsar.

A shrub, smaller than the above; bark dark-grey, peeling off in thin longitudinal strips, inner layer lighter coloured; branchlets scabrous with stellate pubescence. Leaves 1-2.5 by 4-1.3 in., lanceclate, minutely serrulate, rough with stellate pubescence, grey beneath; petiole short. Flowers white, fragrant, 3-4 in. diam., in short trichotomous terminal panicles. Calyx stellate-hairy outside; teeth triangular, erect. Petals oblong, induplicate-valvate, pubescent outside. Styles usually 4. Capsule smaller than of the other species.

Very common in Jaunsar and Tehri-Garhwal, 5,-9,000 ft., usually associated with the last, but sometimes also found on sunny hill-sides which that species avoids.

Wood similar to that of D. corymbosa, but somewhat lighter. Fl. Apr.-June.

3. Philadelphus, Linn.; G. P. n. 29.

1. **P. coronarius,** Linn.; Fl. Br. Ind. ii. 407; Brandis For. Flora 212, Ind. Trees 296; Gamble Man. Ind. Timb. 329. The Mock Orange.

A shrub with light-grey bark, somewhat resembling Deutzia corymbosa. Leaves opposite, 1.5-4 by 7.2.5 in., ovate-lanceolate, long-acuminate, finely hairy and rather glossy beneath; lateral nerves 3 pairs, sub-basal, prominent beneath, very arcuate; petiole 25.5 in. long. Flowers white, 6.8 in. diam., solitary or in few-flowered axillary cymes; pedicels 3.5 in. long. Calyx-tube adnate to the ovary; lobes 4, rarely 5, valvate, pubescent within. Petals 4, rarely 5, convolute in bud, 3.5 in. long. Stamens 20-40; filaments subulate. Ovary inferior, 3-5-celled; styles 3-5, more or less combined at the base. Fruit a capsule, 5 in. long, 3-5-celled, turbinate or obovoid, subtruncate, dehiscing loculicidally.

Common in Tehri-Garhwal beyond the Tons, above 6,000 ft.; Lambátách, Deotá, etc. Rather scarce in Jaunsan: Konáin.

Wood soft, white, with a large pith; weight 44 lbs. per c. ft. Fl. May-July.

4. Itea, Linn.; G. P. n. 47.

1. I. nutans, Royle; JFI. Br. Ind. ii. 408; Brandis For. Flora 213; Ind. Trees 299; Gamble Man. Ind. Timb. 329.

A small tree with dark-grey bark. Leaves alternate, 4-6 by 1·5·2·5 in., ovate or elliptic-oblong, acuminate, glandular-serrate or denticulate, subcoriaceous, glabrous, dark-green and shining above; lateral nerves 5·7 pairs, joined by distinct intramarginal veins. Flowers white, small, in fascicles of 2·5, in simple terminal and axillary racemes which are much longer than the leaves. Calyx adnate to the ovary at the base; teeth 5, erect, persistent. Petals 5, valvate, erect. Stamens 5. Ovary oblong, 2-celled; styles simple, furrowed, persistent. Capsule '2 in long, septicidally 2-valved.

OUTER HIMALAYA and the Dún, also Tehri-Garhwal; above Rájpur; banks of the Ré-nadi near Lachiwála and at Nakraunda and Mothropwála (1,800 ft.); Thadiár, 3,000 ft.

Wood brownish-white, moderately hard.

Fl. Apr.-July. Fr. Oct., Nov.

5. Ribes, Linn.; G. P. n. 71.

Usually unarmed shrubs. Leaves alternate, generally palmately lobed. Flowers middle-sized, often 1-sexual, racemed or solitary; pedicels bracteate. Calyx superior; tube as long as, or longer than, the ovary. Petals 4-5, epigynous, white yellow red or dark-purple. Stamens 4-5, epigynous. Ovary inferior, 1-celled; ovules numerous, on 2 perietal placentas; styles 2, free or connate. Fruit an oblong or globose berry.

Analysis of the Species.

Racemes erect in flower; calyx-tube
hardly exceeding the fruit . . 1. R. glaciale.
Racemes drooping; calyx-tube produced above the fruit . . . 2. R. rubrum.

1. R. glaciale, Wall.; Fl. Br. Ind. ii. 410; Brandis For. Flora 14, Ind. Trees 299; Gamble Man. Ind. Timb. 330.

A shrub, 5-8 ft. high, with shining brown stems; cuticle peeling off in long strips or rolls. Leaves 1-2-5 in. long, cordate, 3-5-lobed with the middle lobe often elongated, or not lobed and ovate, 3-5-nerved at the base, with 2-4 pairs of lateral nerves in the middle lobe, glabrous or pubescent along the nerves beneath, sometimes with scattered hairs above; margins crenate-serrate. Flowers about '25 in. diam., greenish (drying brownish or pink), in pubescent racemes 2-3 in. long which are erect in flower but drooping in fruit; brat much longer than the pedicels. Berries acid, '25 in. long, globose, smooth, glabrous or minutely pubescent.

Tehei-Gaehwal, above 9,000 ft.: Rikhshin. Rare, if it occurs at all, in Jaunsar.

Fl. May. Fr. July.

2. **R. rabrum**, Linn.; Fl. Br. Ind. ii. 411; Brandis For. Flora 215, Ind. Trees 299; Gamble Man. Ind. Timb. 330. The Red Currant. Vern. *Karan*, Jaunsar, probably from *currant*.

A shrub 6-10 ft. high with dark-brown shining stems marked with horizontal baticel-bars; cuticle peoling off in long strips or rolls; young shoots red, glabrate. Leaves (closely resembling those of Acer cæsium) 3-5 in. diam., as broad as long or broader, cordate, 3-5-lobed, crenate-serrate, 3-5-nerved at the base, membranous, glabrescent, somewhat shining beneath; lateral nerves 3-5 pairs on the 3 larger lobes, depressed above, very prominent beneath; petiole red, 3-4 in. long, flattened and with a few scattered grey hairs along the margins near the base. Racemes 4-6 in. long, pubescent, many-flowered, from the nodes of last year's shoots with a few small leaves near the base; bracts not exceeding the pedicels. Flowers greenish-yellow, 3-4 in. diam.; pedicels about 1 in. long. Berries '3-4 in. long, globose, smooth, red.

Common in JAUNSAR and TEHRI-GARHWAL, above 7,500 ft.—Deoban to Mundáli; also at Deotá.

Fl. Apr., May. Fr. May, June.

Saxifraga ligulata, Wall., Fl. Br. Ind. ii. 398. The Wax Flower. Vern. Shilphára (the rock-splitter, which curiously corresponds to the meaning of the generic name), Dhonk-pháláté, Jaunsar,—is an herbaceous plant common and conspicuous enough to deserve mention. Leaves 3.5 in. diam., suborbicular, fleshy, glalrous, strongly ciliate, often pinkish beneath. Flowers pinkish white, waxy, 6.8 in. diam. Petals clawed. Carpels and styles 2, the latter very long. Fl. Apr., May.—G. P. n. 6.

Order 2-MYRTALES.

FAM. 36. RHIZOPHORACEÆ; G. P. N. 65.

Trees or shrubs. Leaves opposite, entire, coriaceous, generally glabrous; stipules interpetiolar, early caducous. Flowers regular, axillary, usually bisexual. Calyx more or less adnate to the ovary or free, 4-14-toothed or lobed, persistent. Petals as many as the calyx-lobes. Stamens 2-4 times the number of petals; filaments free. Ovary 5-1-celled by the absence of the septa; styles usually connate; ovules pendulous. Fruit 1-celled, 1-seeded, coriaceous, indehiscent. Seeds exalbuminous.

1. Carallia, Roxb.; G. P. n. 5.

1. **C. integerrima**, DC.; Fl. Br. Ind. ii. 439; Brandis For. Flora 219; Gamble Man. Ind. Timb. 335. Syn.—*C. lucida*, Roxb.; Brandis Ind. Trees 305, 709.

An evergreen tree; bark dark-grey and smooth on old stems, lighter-grey and corky on young poles, often developing bunches of fleshy adventitious roots on the trunk. Leaves 3-5 by 1.5-3 in., elliptic obovate, entire or minutely serrulate above the middle, coriaceous, glabrous, shining; margins usually recurved; main lateral nerves 8-10 pairs, indistinct until dry; petiole 2-4 in. long, stout, margined; stipules 5-1-2 in. long, interpetiolar, lanceolate, convolute, terminating the branchlets. Flowers sessile, 6-8-merous, .2 in. across, in short axillary trichotomous cymes; peduncles and pedicels stout. Calyx-lobes 5-8, erect. valvate. Petals 5-8, white, orbicular, serrate at the apex. Stamens twice as many as the petals and opposite to them; filaments filiform. Fruit about 2 in. across, globose, 1-celled, usually 1-seeded.

Only a few trees have been found in the Nakraunda swamp and along the banks of the Ré-nadi near Lachiwála, 1,800 ft.; also on the Táwá nálá near Khairi, 1,200 ft.

The heartwood is red, hard and durable, and works and polishes well. It has a very pretty silver-grain resembling that of the oaks. "It is used in South Kanara for furniture and cabinet-

making and in Burma for planking, furniture and rice-pounders."— Mr. J. S. Gamble. The leaves are lopped for cattle-fodder.

Fl. Dec.-Apr.

FAM. 37. COMBRETACEÆ; G. P. N. 66.

Trees or shrubs. Leaves usually simple, petiolate, entire, opposite or alternate, exstipulate. Flowers bracteate, usually bisexual. Calyx-tube adnate to the ovary; lobes 4-5, valvate. Petals 4-5, or none. Stamens 4-5, or twice as many, inserted on the calyx. Ovary inferior, 1-celled; style simple; ovules 1-7, pendulous from the apex of the cell. Fruit usually a coriaceous drupe, 1-celled, 1-seeded, winged or angular; seed exalbuminous; cotyledons convolute or plano-convex, often fleshy and oily.

Analysis of the Genera.

Flowers in spikes or racemes.

Large trees with alternate or sub-opposite leaves.

Petals none 1. Terminalia.

Climbing shrubs with opposite leaves. Petals
generally present 3. Combretum.

Flowers in heads; leaves alternate or inconstantly
opposite; petals none 2. Anogeissus.

1. Terminalia, Linn.; G. P. n. 1.

Large trees. Leaves alternate or sub-opposite, entire or slightly crenulate, exstipulate, often with glands on the petiole. Flowers small, sessile, usually bisexual; bracts deciduous. Calyx-tube produced over the ovary with a constricted mouth; lobes 4-5, valvate. Petals 0. Stamens 8-10, inserted on the calyx-tube in two rows. Ovary 1-celled; ovules 2-3, pendulous. Fruit oblong ovoid ellipsoidal or globose, winged or angular, with a coriaceous or bony kernel; cotyledons convolute.

Analysis of the Species.

Fruit fleshy, not winged.

Petiole long; fruit velvety, not ribbed . . 1. T. belerica.

Petiole short; fruit glabrous, more or less ribbed 2. T. Chebula.

Fruit coriaceous, with 5 proad wings . . . 3. T. tomentosa.

1. **T. belerica**, Roxb.; Fl. Br. Ind. ii. 445; Brandis For. Flora 222, Ind. Trees 307, 709; Gamble Man. Ind. Timb. 337. Vern. Baherá. Hind.

A large deciduous tree with bluish or ashy-grey bark uneven with longitudinal furrows. Leaves alternate, crowded towards the ends of the branches, 3-8 in. long, obovate-elliptic, coriaceous, pale beneath, subacute or acuminate; lateral nerves 5-8 on either side of the thick midrib; base often unequal; petiole 1-3 in., usually glandular. Spikes 3-6 in. long, simple, slender, interrupted. Flowers about 2 in. across, pale-white or greenish-yellow, with an offensive smell, the upper often male; bracts early caducous. Calyx-lobes triangular, woolly inside. Ovary tomentose. Fruit 1 in. long, ovoid ellipsoidal or globose, grey-velvety; nut thick-walled and hard.

It is a constant companion of Sáland is found almost everywhere in the Dún and Saháhanpur Forests; also in Jaunsar in the Ámláwa and Tons Valleys.

It grows to a height of 80-100 ft. with a girth of 8-10 ft., and is easily recognized from a distance by its characteristic bark and broad massive crown. The wood is light-grey or yellowish, hard and coarse-grained, not durable; heartwood and annual rings not distinct; weight about 50 lbs. per c. ft. It is used for various purposes, from house-building to packing-cases, and sells readily in the region of this Flora. The fruit is very valuable, being one of the myrobolans of commerce. "It is a favourite food of monkeys, deer, sheep, goat and cattle,"—Sir D. Brandis, and is used in dyeing and making ink. The kernel is edible, and gives an oil which is used for the hair.

Fl. Apr.-June, after the new leaves. Fr. Dec.-Feb.

¹ 2. **T. Chebula,** Retz.; Hook. Fl. Br. Ind. ii. 446; Prandis For. Flora 223, Ind. Trees 308; Gamble Man. Ind. Timb. 338. Vern. Har, Hart, or Harath, Hind.

A large deciduous tree with dark-brown bark; young parts covered with rusty hairs. Leaves mostly sub-opposite, 3-6 in. long, ovate or oblong-ovate, acuminate; lateral nerves arcuste, prominent, 6-12 on either side of the midrib; base acute or rounded; petiole hardly exceeding 1 inch, often with 2 or more glands on the upper

side. Flowers about 'l in. across, all bisexual, sessile, dull-white, in panicled or clustered usually-terminal spikes; bracts subulate. Calyxlobes soutely triangular, covered inside with brown hairs; limb cup-shaped. Stamens 8-10; filaments long, spreading. Fruit 1-2 in. long, obovoid, ellipsoidal or ovoid, more or less distinctly ribbed; nut hard, with a rough grooved surface.

Found in the same localities as the last, but is generally less common. It is, however, fairly common in certain limited areas, e.g., along the Lambi Ráu, Tháno; south of the Sample area, Lachiwála; forests near Timli, etc.

In the region of this Flora it is a smaller tree than the last. The heartwood is pale or dark-brown with a greenish tinge, finely mottled, hard, close-grained, fairly durable, and is used for house-building, agricultural implements and furniture; weight about 60 lbs. per c. ft. The bark, the galls formed on young twigs, and the fruit are used for tanning and dyeing. Indeed the last is the most important part of the tree, being the black myrobolan of commerce and is largely exported to Europe from Bombay. The unripe fruit is a favourite drug in Hindu medical practice.

New leaves in April. Fl. Apr.-June. Fr. Jan.-Mar.

3. **T. tomentosa**, W. & A.; Fl. Br. Ind. ii. 447; Brandis For. Flora 225, Ind. Trees 310; Gamble Man. Ind. Timb. 341. Vern. Sáin, Dún and Saháranpur; Asainá, Hind.

A large deciduous tree; bark dark-grey or black much furrowed, exfoliating in thick rectangular plates; inner bark reddishbrown; young parts rusty-pubescent. Leaves alternate or subopposite, 5-9 by 2·5-4 in., oblong elliptic or obovate, coriaceous, glabrescent above, tomentose beneath; lateral nerves 10-20 pairs, parallel, slightly arcuate; base often unequal sided, acute or rounded; petiole ·3·4 in., often with a gland or two on the sides. Flowers bisexual, dull-yellow, ·1··15 in. across, sessile, in large erect panieled spikes. Calyx-lobes ovate. broad-acute, often hairy; free part of the tube salver-shaped. Fruit 1·5·2·5 in. long, with 5 broad transversely-striated coriaceous wings having a crenulate edge.

Associated with Sél in the SIWALIK DIVISION, especially in clayey localities; also found in the OUTER HIMALAYAN VALLEYS, up to 4,000 ft.

It grows to a height of 80-100 ft. with a girth of 8-10 ft. Sapwood reddish or yellowish-white; heartwood dark-brown, with darker streaks, very hard, seasons well, but is liable to split. It is used for house-building, agricultural implements and such other purposes. It is also an excellent fuel and gives very good chargoal.

The bark is much used for tanning and sometimes also for dyeing. The "Tassar" silkworm is fed on the leaves in the Central Provinces. Sain coppies and pollards well, and is a good nurse for young Sai in frosty localities. The overy is sometimes attacked by a gall-insect which prevents the fruit being formed.

New leaves May, June. Fl. June-Aug., and sometimes a second flush in the cold season (Dec. 1893 in the Dún). Fr. Feb.-Apr.

T. Arjuna, Bedd.; Fl. Br. Ind. ii. 447.; Vern. Arjún, Hind.;—is a tree closely resembling the last species in foliage and inflorescence, but differs in having smooth grey bark and smaller 5-7-winged fruit. It is an excellent avenue tree and has been planted as such near Fatehpur on the Saháranpur-Chakrata road, and (but looking almost like self-sown) on the Dehra-Hardwar and Hardwar-Rikhikesh roads not far from Pardúni and in the swamp near that place. The wood is used for much the same purposes as that of Sáin.

Fl. Apr., May. Fr. Cold season.

2. Anogeissus, Wall.; G. P. n. 5.

 A. latifolia, Wall.; Fl. Br. Ind. ii. 450; Brandis For. Flora 227, Ind. Trees 315; Gamble Man. Ind. Timb. 346. Vern. Bákli, Bánkli, Hind.

A tall tree with smooth greenish-white bark. Leaves alternate or inconstantly opposite, 2-4 by 1-2-5 in., elliptic, ovate or ovate-lanceolate, acute obtuse or emarginate, subcoriaceous, glabrescent; petiole '3-'5 in. long. Flowers small, in globose heads; heads about '5 in. diam., in short axillary racemes. Calyx-tube compressed, laterally 2-winged, long and narrowed above the ovary. Petals 0. Stamens 10, in two series. Ovary 1-celled; ovules 2, pendulous. Fruit a dry drupe '3 by '2 in., compressed, narrowly 2-winged, imbricately arranged in the head, crowned with the remains of the calyx-tube which is now modified into a stiff beak.

Common in the Dún and Saháranpur Forests and on the Outer Himalayan slopes ascending to 4,000 ft.; sometimes gregarious in small patches on alluvial banks of streams.

Wood grey, close- and even-grained, compact, hard, very tough and elastic, but splits in seasoning, and is not durable unless kept dry; weight 55-70 lbs. per c. ft. It is used extensively for construction, furniture, agricultural implements, house-posts, poles for

carrying loads and such other purposes requiring toughness and elasticity. The tree yields a very clear gum which is soluble in water, and the leaves are much valued for tanning.

Fl. May, June. Fr. Cold season.

3. Combretum, Linn.; G. P. n. 10.

1. **C. decandrum**, Roxb.; Fl. Br. Ind. ii. 452; Brandis For. Flora 221, Ind. Trees 312; Gamble Man. Ind. Timb. 349. Vern. Rúel or Roel, Dún.

A large climbing shrub; young parts covered with silky pubescence. Leaves opposite, 4.5 by 1.5.2.3 in., elliptic-oblong, acuminate, glabrous, the floral ones or bracts 2.2.5 in. long, dull-white, villous; lateral nerves 6.8 on either side of the midrib, arcuate; petiole 2.4 in. long. Flowers greenish-white, about 15 in. long, numerous, in dense villous cylindrical racemes about 1 in. long, which in their turn are arranged in large terminal panieles. Calyx hairy; lobes 5, valvate, deciduous. Petals 5, small, oblong, glabrous, inserted between the calyx-lobes. Stamens 10, in two series. Ovary 1-celled; ovules 2.5, pendulous. Fruit 1 in. long, oblong or elliptic, with 4.5 smooth papery wings.

Very common in the Western Dún, especially from Ámbári to Kálsi. All the hill-side round the latter town is clothed in white when this climber flowers with its characteristic petaloid bracts.

Fl. Feb., Mar. Fr. May, June.

C. nanum, Ham.; Fl. Br. Ind. ii. 457;—is a small procumbent undershrub found in grass lands near Maindrot in the Tons Valley, Tehri-Garhmal, and also occasionally in similar localities in the Dón, e.g., Sabháwála. Leaves opposite, 2-4 by 1·5·3·5 in., ovate or obovate, glabrous. Flowers in terminal and axillary racemes. Fruit 1·5 by 1 in., coriaceous, light, with 4·5 papery wings. It grows annually from a perennial rootstock down to which it is burnt by forest fires.

Quisqualis indica, Linn.; Fl. Br. Ind. ii. 459, the Rangoon-creeper,—is a climbing shrub cultivated in gardens in Saháranpur and the Dún. Leaves opposite, about 4 in. long, obovate, acuminate, entire. Calyx-tube prolonged about 2 in. above the ovary; limb 5-fid. Petals red, oblong or round. Fruit extremely rare, about 1 in. long, sharply 5-angled, glabrous, black.—G. P. n. 12.

FAM. 38. MYRTACEÆ; G. P. N. 67.

Trees or shrubs, rarely herbs. Leaves opposite, exceptionally alternate, simple, usually entire and gland-dotted, exstipulate, mostly coriaceous. Flowers generally bisexual, solitary or in heads cymes or corymbs. Calyx-tube adnate to the ovary; limb 4-5-cleft, or entire, deciduous or persistent. Disk coating the calyx-tube. Petals inserted on the disk, as many as the calyx-lobes and alternating with them, rarely absent. Stamens usually indefinite, inserted with the petals in several rows; filaments free or connate at the base forming bundles or a short tube. Ovary syncarpous, inferior or half-inferior, 1-celled, 1-ovuled, or 2-many-celled with indefinite ovules on axile placentas. Fruit dehiscent or indehiscent, crowned with the remains of the calyx-limb; seeds compressed or angular, exalbuminous.

Analysis of the Genera.

Leaves opposite, entire, gland-dotted . . . 1. EUGENIA. Leaves alternate, crenate-serrate, not gland-dotted 2. CAREYA.

1. Eugenia, Linn.; G. P. n. 58.

Evergreen trees or shrubs. Leaves opposite, entire, penninerved. Flowers usually tetramerous, in lateral or terminal trichotomous cymes or panicles. Bracts small, deciduous. Calyx-tube globose or more or less elongate; lobes usually 4. Petals generally 4, free or united in a calyptra. Stamens indefinite, in several series, free or slightly combined into four bundles; anthers versatile. Ovary usually 2-celled, with several ovules in each cell. Fruit a drupe-like berry, crowned with the remains of the calyx-limb; seeds variously compressed.

Analysis of the Species.

Lvs. subcoriaceous, soft; lateral nerves distant 1. E. operculata.

Lvs. coriaceous, tough; lateral nerves very close 2. E. Jambolana.

1. **E. operculata**, Roxb.; Fl. Br. Ind. ii. 498; Brandis For. Flora, 234, Ind. Trees 322; Gamble Man. Ind. Timb. 360. Vern. *Piáman*, *Thúti*, Dún.

A moderate-sized evergreen tree; bark rough with irregular hard scales. Leaves 3-6 by 2-3·5 in., broad-ovate or elliptic, rounded at the apex or obtusely acuminate, very variable in shape and size, subcoriaceous, soft, turning red in the cold season; lateral nerves 8-12 pairs, prominent beneath, gradually fainter towards the margin; petiole '7-1 in. long. Flowers tetramerous, small, greenish, sub-sessile, in 3-flowered cymes arranged in trichotomous lateral panicles below the current year's leaves. Calyx campanulate, with short obtuse lobes. Petals united and falling off in one piece (operculum). Berry globose or ovoid, '3-'5 in. diam., juicy.

Common in the Dén and Saháranpur Forests, especially in blanks inside Sál areas, where it is often the first tree to appear, under whose shelter seedlings of superior species have a better chance against frost and excessive heat.

Heartwood not distinct. Wood brown or reddish-grey, hard, close- and fine-grained; weight 45-50 lbs. per c. ft. It is used for building and agricultural implements. The fruit is edible.

Fl. Apr., May, sometimes also in autumn. Fr. three months after flowering.

2. **E. Jambolana**, Lam.; Fl. Br. Ind. ii. 499; Brandis For. Flora 233, Ind. Trees 323; Gamble Man. Ind. Timb. 361. Vern. Jáman, Jáman, Hind.

A large evergreen tree; bark light-grey, fairly smooth, with shallow depressions caused by exfoliation. Leaves 3-6 by 1.5-2.5 in., very variable in shape, ovate-oblong or oblong-lanceolate, acuminate, coriaceous, tough, smooth, shining above except when very old; lateral nerves numerous, almost straight, very fine, uniting within the margin to form intramarginal nerves; petiole 3-1 in., channelled. Flowers tetramerous, small, greenish, subsessile, arranged in threes in lateral or terminal trichotomous panicles. Oalyx-tube funnelshaped; limb campanulate, subtruncate. Petals united into a calyptra and falling off in one piece. Berry 5-1 in. long, oblong-

obovoid or sub-globose, pink while ripening; black smooth shining and very juicy when fully ripe, deep-pink below the thin elastic black skin.

Very commonly associated with Sál in the Dún, less so in the Saháranpur Forests. It is almost gregarious in damp and swampy localities, mixed with laurels and other evergreen trees. It is also found in the Tons Valley, Jaunsah and Tehri-Garhwal, up to 4,000 ft., and along streams in the Saháranpur Siwaliks.

The heartwood is reddish-brown, tough and hard, very durable under water but less so and liable to warp if kept dry; weight about 45 lbs. per c. ft. It is used for building, agricultural implements and well-work, being especially suitable for use under water. The bark is used for dyeing and tanning and also in medicine. The fruit is eaten, and is considered good for people suffering from want of appetite or enlargement of the spleen. The kernel of the fruit is a specific for diabetes.

E. Jambos, Linn., Fl. Br. Ind. ii. 474. Vern. Guláb Jámún or Guláb Jám, Hind., the Rose-apple,—is cultivated for its fruit and for ornament in gardens in the Dún. It is an evergreen tree with narrow lanceolate acuminate shining leaves, and large white tassel-like tetramerous flowers in short cymose terminal racemes. Berry 1-2 in. long, obovoid or subglobose, crowned with the 4 persistent calyxlobes, having a sweet taste and a delicate odour of rose when ripe,—whence the vernacular names.

2. Careya, Roxb.; G. P. n. 62.

1. C. arborea, Roxb.; Hook. Fl. Br. Ind. ii. 511; Brandis For. Flora 236, Ind. Trees 322; Gamble Man. Ind. Timb. 364. Vern. Kumbi, Kumbhi, Hind.

A fairly large deciduous tree; bark dark-grey, exfoliating in thin narrow strips, fibrous inside. Leaves alternate, 6-12 by 3-6 in., obovate oblanceolate or oblong, obtuse or shortly acuminate, sessile or narrowed into a very short marginate petiole, finely crenate or serrate, rather membranous, glabrous. Flowers sessile, 3-4 in. across, usually a few together in terminal spikes, 3-8 in. long. Calyx-lobes 4, ovate, obtuse, imbricate; tube almost wholly adnate to the ovary, funnel-shaped. Petals 4, about 2 in. long, elliptic, white, very tender, caducous. Stamens very numerous, in several series; filaments red, filiform, 2-3 in. long, connate into a short tube below, the innermost and outermost without anthers. Ovary 4- rarely 5-celled; style long, simple, erect; ovules many, on axile placentas. Fruit globose, about 3 in. diam., crowned with the calyx-segments and the remains of the long filiform style.

Found only sporadically in the Don and Saharanpur Forests, usually in shady places.

The heartwood is scanty, dull-red or reddish-brown, mottled, even-grained, hard, strong and elastic, takes a good polish, seasons well and is very durable; the weight varies between wide limits, being 38-60 lbs. per c. ft. It is used for agricultural implements and cart-building, and is much sought after by boatmen in Assam for oars and rudders on account of its elasticity and durability. The bark is used in medicine, and fuzes, coarse cordage and sacks are made from the inner substance.

Fl. and new leaves Mar., Apr. Fr. July.

C. herbacea, Roxb.; Fl. Br. Ind. ii. 510, is a small perennial undershrub having a woody rootstock, found on grassy slopes of the Siwaliks, and in the Pathri forest, Saháranpur. Leaves 6-8 by 2-3 in., obovate, oblanceolate or spathulate. Petals about 1'5-2 in. long, greenish-purple, elliptic. Fruit 1'5 in. diam., much like that of C. arborea.

The following Genera need only be briefly noticed:-

- 1. PSIDIUM, Linn.; G. P. n. 45. Leaves opposite, aromatic but not dotted. Flowers large, white, on axillary peduncles. Calyx-tube obovate; lobes 4-5, valvate. Petals free. Fruit a many-seeded berry.
- P. Guava, Raddi.; Fl. Br. Ind. ii. 468. Vern. Amrúd Hind.,—is the Guava tree of gardens. The wood is hard and evengrained and is used for wood-engraving, instruments, and handles of spears.
- 2. EUCALYPTUS, L'Her.; G. P. n. 30. Leaves in saplings opposite, horizontal, cordate, sessile; in mature trees alternate, vertical, petiolate, ovate to lanceolate, acuminate, falcate. Flowers in umbels or heads. Stamens very numerous, capped in the bud with a caducous operculum. Fruit woody consisting of the enlarged calyx-tube; seeds often very minute.

Many species of this very large Australian Genus have been introduced in India, and plantations of one of them,—E. globulus, Labill, the Blue Gum,—successfully made in the Nilgiris. E.

tereticornes, Smith, and E. citriodora, Hooker, are growing fairly well in Dehra and Saháranpur.

3. Barringtonia, Forst.; G. P. n. 61. Leaves alternate, crowded at the ends of the branches, crenateserrate, not dotted. Flowers in long terminal or lateral racemes. Calyx-tube ovoid. Petals 4-5, imbricate. Stamens indefinite; filaments very long. Fruit fibrous and berry-like.

B. acutangula, Gærtn.; Fl. Br. Ind. ii. 508. Vern. Sanáffar, Injar, Hind.,—cultivated in gardens in Dehra for its red flowers in long pendulous racemes. Leaves obovate, usually serrulate, narrowed into a short petiole. Ovary 2-celled. Fruit oblong, 4-angled. The wood has a handsome silver-grain and can be used for furniture.

FAM. 39. MELASTOMACEÆ; G. P. N. 68.

Herbs or shrubs. Leaves opposite or whorled, simple, entire, 3-7-nerved from the base to the apex. Flowers usually terminal, regular, 2-sexual. Calyx-tube generally constricted above, more or less adnate to the ovary. Petals twisted in bud. Stamens 4-10, alternate ones being often rudimentary; anthers usually opening by pores at the apex, connective tubercled or spurred. Ovary 4-5-celled; style simple, filiform. Fruit usually a many-seeded capsule. Seeds exalbuminous.

This Order is of little interest in this part of the country although some Genera as *Memecylon*, are common and important in the forests of Southern and Eastern India. The following plants of Genus *Osbeckia*, Linn.; *G. P. n. 38*,—need only be briefly noticed:—

1. O. stellata, Wall.; Fl. Br. Ind. ii. 517. A hairy shrub, 4-6 ft. high, with tetragonal branches, found at Chakrata, Mussoorie, etc. Leaves 3 in. long, lanceolate, 5-nerved, with short hairs on both surfaces; petiole 4 in. Flowers purple, about 1 in. across. Calyx demsely woolly outside. Fruit 5 in. long, ovoid, felted outside. II. Aug.-Oct.

2. O. chinensis, Linn.; Fl. Br. Ind. ii. 515. An undershrub about 2 ft. high, found in damp localities in the Dún, e.g., Rámgarh. Leaves 2-3 in. long, narrow-oblong, 3-5-nerved, hairy; petiole 15 in. Flowers mauve. Calyx slightly pubescent outside, nearly glabrous in the fruit. Fruit ovoid, 3 in. long. Fl. Sept., Oct.

FAM. 40. LYTHRACEÆ; G. P. N. 69.

Trees, shrubs, or herbs, often with quadrangular branches. Leaves entire, generally opposite; stipules none. Flowers bisexual, usually regular, solitary or in cymes or panicles. Calyx-tube free, persistent; lobes 3-6, valvate. Petals as many as the calyx-lobes, and alternating with them, rarely absent. Stamens definite or indefinite, inserted on the calyx-tube. Ovary 2-6-celled, usually free; style long, persistent; ovules many, attached to an axile placenta. Fruit a capsule, 1-4- or many-celled; seeds numerous, without albumen.

Analysis of the Genera.

Flowers irregular; ovary superior . 1. WOODFORDIA.
Flowers regular; ovary superior.
Flowers 4-merous; stamens 8 . . 2. Lawsonia.
Flowers 6-merous; stamens indefinite 3. Lagersteemia.
Flowers regular; ovary inferior . . 4. Punica.

1. Woodfordia, Salisb.; G. P. n. 8.

1. **W. floribunda**, Salisb.; Fl. Br. Ind. ii. 572; Brandis For. Flora 238, Ind. Trees 341; Gamble Man. Ind. Timb. 369. Vern. Dháulá, Dháu, Hind.; Dháttrí, Sans.

A large shrub with long spreading branches; stem more or less fluted, often with 1 or 2 concentric bands of cortical tissue inside the wood; bark smooth, peeling off in thin scales; young shoots and leaves with numerous black glands. Leaves opposite or sub-opposite, sometimes in whorls of 3, distiohous, subsessile, 2-4 by 8-13 in, lanceolate or ovate-lanceolate, usually acuminate, rounded or cordate at the base, entire, pale and generally grey pubescent beneath; lateral nerves 6-12 pairs, prominent beneath and joined by intramar-

ginal veins. Flowers in short panicled axillary cymes, rarely solitary. Calyx 4-6 in. long, tubular, bright-red, curved, oblique at the mouth; teeth 6, short, with as many minute accessory lobes outside. Petals 6, white, acute, inserted in the sinuses of the calyx-tube and scarcely exceeding the calyx-teeth. Stamens 12, much exserted, declinate, inserted near the base of the calyx; filaments red; anthers versatile. Ovary 2-celled; ovules many, on axile placentas. (The stamens and styles are of varying lengths, the flowers thus becoming dimorphic or trimorphic.) Capsule ellipsoid, included in the persistent calyx-tube; seeds many.

Very common in Saháranpur and the Dún. Also in valleys up to 5,000 ft. in the Hills, e.g., Ámláwa, Binálgádh, Dhárágádh, Dhármlgádh, Tons and Pábar Valleys, etc.

Wood reddish-white, close-grained, hard, weighing 46 lbs. per c.ft. It is suitable for axe-handles, but is used chiefly for fuel. The flowers give a red dye, which is used for dyeing silk. The bark is used in Hindu medicine.

Fl. Feb.-Apr. Fr. Apr.-June.

2. Lawsonia, Linn.; G. P. n. 19.

L. alba, Lamb.; Fl. Br. Ind. ii. 573; Brandis For. Flora
 Ind. Trees 340; Gamble Man. Ind. Timb. 370. Vern.
 Mehydi, Hind.

A shrub with thin greyish-brown bark; branchlets angular, sometimes spinescent. Leaves opposite, '7-1 in. long, elliptic, acute at both ends or the tip obtuse, minutely petioled, entire, coriaceous. Flowers '2 in. diam., greenish-white, sweet-scented, in large cymosely-branched terminal panicles. Calyx-tube exceedingly short; lobes 4, '1 in. long, ovate, persistent. Petals 4, wrinkled. Stamens usually 8, inserted in pairs between the petals. Ovary free, 4-celled; ovules many, on axile placentas; style long. Capsule '2 in. diam., globose, ultimately 1-celled, irregularly breaking up; seeds angular, on a central placenta.

It is cultivated in Saharanpur and the Din, indeed throughout India, as a hedge-plant, and also for its leaves, which are used to dye the nails, skin and beard. A plaster of the green leaves is said to be good for itches and other skin-diseases. A delightful essence is extracted from the flowers, which passes by the name Henna in Upper India.

Fl. and fr. throughout the year.

3. Lagerstræmia, Linn.; G. P. n. 24.

Trees or shrubs. Leaves opposite (or the uppermost alternate), entire, short-petiolate. Flowers bracteate in axillary or terminal panicles. Calyx-tube funnel-shaped, smooth or grooved; lobes usually 6, ovate, valvate. Petals 6, long-clawed, inserted between the calyx-lobes. Stamens numerous; filaments filiform exserted; anthers versatile. Ovary sessile, 3-6-celled; style filiform; ovules numerous on axile placentas. Capsule coriaceous, 3-6-celled, loculicidally dehiscent, strongly seated on the persistent calyx; seeds winged.

1. **L. parviflora**, Roxb.; Fl. Br. Ind. ii. 575; Brandis For. Flora 239, Ind. Trees 338; Gamble Man. Ind. Timb. 371. Vern. *Dhaurá*, *Dhauri*, Dún; *Adhuári*, Saháranpur.

A fairly large deciduous tree; bark light-brown or ash-coloured, even, smooth, exfoliating in dark-coloured sourfy pieces. Leaves 2:5-4 in. long, oblong, acute or acuminate, coriaceous, glabrous above, glaucous and very closely reticulate beneath; petiole about '1 in. long. Flowers '2-3 in. across, white, fragrant, in lax axillary and terminal panicles. Calyx smooth, glabrous or pubescent. Petals very membranous, with a wavy margin. Filaments too weak to be straight, 6 of the outermost series longer than the rest. Capsule ovoid or cylindrical, '6-1 by '4-'6 in., a quarter immersed in the somewhat accrescent and woody calyx; seeds with a terminal wing having a thick curved back, '5 in. long including the wing.

A constant companion of Sál and also one of the principal species in scrub jungles; hence very common in the Dún and Saháranpur Forests.

Wood greyish-brown, often with a reddish tinge, smooth- and even-grained, very hard, seasons well. takes a fine polish; fairly durable; weight 40-60 lbs. per c. ft. It is used for agricultural implements, for construction, buggy-shafts and axe-handles. The bark and the leaves are used for tanning.

New leaves in May. Fl. May-July. Fr. Autumn, but remains long on the tree.

L. indica, Linn.; Fl. Br. Ind. ii. 575. Vern. Sáoni, Hind—a shrub with showy flowers, is oultivated in gardens throughout India.

and is conspicuous in Dehra Dún. Leaves 2 in. long, glabrous, oblong. Calyx not woody in the fruit. Petals bright-pink or milky-white, long-clawed, much curled.

L. Flos-Reginæ, Retz.; Fl. Br. Ind. ii. 577. Vern. Járúl, E. Beng., Ajhár, Assam—is a large tree cultivated in gardens at Dehra for ornament. Leaves 5-10 in. long, elliptic or lanceclate, petiolate. Flowers 2-3 in. across, mauve, in large terminal panicles. Calyx woody and much grooved in the fruit. Petals clawed, margins very wavy. Capsule 1 in. long, globose. It is a well-known timber tree of Eastern Bengal, Assam and Burma.

4. Punica, Linn.; G. P. n. 27.

This is an anomalous Genus, being closely allied to MYRTACEÆ through *Psidium* and to ROSACEÆ through *Cydonia*.

1. **P. Granatum,** Linn.; Fl. Br. Ind. ii. 581; Brandis For. Flora 241, Ind. Trees 341; Gamble Man. Ind. Timb. 377. The Pomegranate. Vern. Dánoi, Jaunsar; Ánár, Hind.

A shrub or small tree with dark-grev bark; branchlets often spinescent. Leaves opposite sub-opposite or clustered, 1-2.5 by 4-1 in., oblong, obovate or oblanceolate, obtuse, narrowed to a short marginate petiole, entire, rather membranous, quite glabrous, shining, lateral nerves indistinct. Flowers sessile, terminal, solitary or in short 3-flowered cymes. Calyx adnate to the overy below, (in flower) about 1 by 5-6 in., tubular, greenish-red, fleshy; lobes 5-7, valvate, acute. sub-erect. Petals as many as the calvx-lobes, 5-1 in. long, oblanceolate, very membranous, wrinkled, bright-red. Stamens numerous, inserted in the calyx-tube below the petals; filaments distinct. Ovary inferior, with many cells in two whorls; ovules numerous on axile placentas in the inner cells and parietal in the outer; style long; stigma capitate. Fruit (in the wild state) about 1.5 in. diam., globose, with a reddish-brown coriaceous rind which ultimately breaks up irregularly; seeds about '2 in. long, angled, with a pellucid reddish-vellow or ruby-coloured aril filled with an acid or sweet juice. Under cultivation the fruit is about 3 in. in dia m., and very much better in quality.

The Pomegranate is cultivated in Saháranpur and the Dún, and is found wild in valleys below 6,000 ft. in Jaunsar and Tehri-Garhwal; Dhármigádh, Maindrot, Binálgádh, Khúnigádh, etc.

Wood light-yellow, compact and close-grained; weight 57 lbs. per c. ft. The flowers give a light red dye. The fruit is eaten, the bark and the rind of the fruit are very astringent, and are used in medicine as well as for tanning.

Fl. Apr., May. Fr. July-Sept.

Order. 3.—PASSIFLORALES.

FAM. 41. SAMYDACEÆ; G. P. N. 71.

Trees or shrubs. Leaves alternate, distichous, simple; stipules small, deciduous. Flowers regular, small, shortly pedicelled, often fascicled. Calyx coriaceous, persistent, free or adnate to the ovary; limb 3-7-fid. Petals imbricate, as many as, and alternating with, the calyx-lobes, or none. Stamens definite or indefinite, often with staminodes between. Ovary free or more or less adnate to the calyx-tube, 1-celled; style 1 or 2-5; ovules few or many, on usually 3 parietal placentas. Fruit a 1-celled, generally 2-5-valved, loculicidally-dehiscent capsule; seeds albuminous.

1. Casearia, Jacq.; G. P. n. 1.

Shrubs or small trees. Leaves entire or slightly serrate, often remotely punctate beneath; stipules small, caducous. Flowers greenish-yellow, small, fascicled. Calyx-tube short, with 4-5 imbricate lobes. Petals none. Stamens 6-15, alternating with as many staminodes or scales, usually united in a short hypogynous tube. Ovary superior, 1-celled, narrowed into a short style; stigma 3-fid; ovules many, attached to 3-4 parietal placentas. Fruit fleshy, ovoid, usually 3-valved; seeds with a fleshy aril.

Analysis of the Species.

Leaves and branchlets glabrescent, the former elliptic. 1.C. graveolens. Leaves and branchlets tomentose, the former oblong. 2.C. tomentosa.

1. C. graveolens, Dalz.; Fl. Br. Ind. ii. 592; Brandis For. Flora 243, Ind. Trees 343; Gamble Man. Ind. Timb. 378. Vern. Chilli, Hind.; Nará or Narhá, Dún; Phempri, Garhwal.

A small deciduous tree with long horizontal branches; bark dark-grey, with white specks and a few longitudinal wrinkles. Leaves 4-8 by 2.5-4 in., elliptic, obtuse or shortly acute, more or less crenate, glabrous; lateral nerves 8-10 pairs; base rounded, sometimes acute; petiole '2.5 in. long; stipules '5 in. long, deciduous. Flowers glabrous, numerous, clustered in the axils of the leaves; pedicels short, jointed, pubescent below the joint. Calyx 5-lobed, pubescent. Stamens 8, alternating with hairy staminodial scales. Fruit 3-valved, '7-1 in. long, ellipsoid, glabrous.

Fairly common in certain parts of the Dún Forests, loss so on the other side of the SIWALIES,—Tháno, Nágsidh, Ásárori, Karwápáni, Dharmáwála, Pardúni; Ránipur, Dholkhand, etc.

Wood light-yellow, even-grained and moderately hard, weighing 40-50 lbs. per c. ft., used only for fuel. The fruit is used to poison fish.

Fl. May, June. Fr. July, Aug.

2. C. tomentosa, Roxb.; Fl. Br. Ind. ii. 593; Brandis For. Flora. 243, Ind. Trees 343; Gamble Man. Ind. Timb. 379. Vern. Chillá. Hind.

A small deciduous tree with numerous horizontal branches; bark light-grey on branches but dark-brown on old stems, peeling off in square flakes; inner substance not fibrous. Leaves 3-7 by 17-3 in. oblong elliptic-oblong or lanceolate, serrate or crenate, sometimes nearly entire, sub-coriaceous, tomentose, remotely gland-dotted; base rounded or acute, often oblique; petiole very variable in length; stipules minute, caducous. Flowers tomentose, small, greenish-yellow, numerous, fascicled in the axils of leaves; pedicels '2-3 in. long, hairy. Calyx 4-5-cleft, hairy. Stamens 8, alternating with hairy scale-like staminodes. Fruit 3-valved, 7-8 in. long, obovoid, fleshy, yellow when ripe, 6-ribbed in dry specimens; seeds embedded in a red pulp.

Very common throughout the Dún and Sahábanpur Forests, especially in scrub-jungle and in the outskirts of Sál forests.

Wood dirty-white or yellowish, even-grained, compact, moderately hard, strong and elastic; medullary rays fine and wavy; heart-

wood not distinct; weight about 40 lbs. per o. ft. It is sometimes used for making combs. The pounded fruit is used to poison fish.

New leaves Mar., Apr. Fl. Mar.-May. Fr. June, July.

Order 4.—UMBELLALES.

FAM. 42. ARALIACEÆ; G. P. N. 81.

Soft-wooded trees or shrubs, sometimes scandent. Leaves alternate, simple or compound, long-petioled; stipules adnate to the petiole, or absent. Flowers regular, small, sometimes polygamous, in umbels racemes or panicled heads; bracts and bracteoles small or conspicuous. Calyx-tube adnate to the ovary; limb short, truncate or with small teeth. Petals usually 5, valvate or sub-imbricate, deciduous. Stamens as many as, and alternating with, the petals, inserted on an epigynous disk; filaments inflexed; anthers versatile. Ovary inferior, 2- or more-celled; styles as many as the cells; ovules solitary, pendulous. Fruit a drupe or a berry, sometimes 1-celled by suppression.

Analysis of the Genera.

Leaves simply or compo	oundly	pinna	te or o	ligit	ate	•
Petals imbricate in b	ud.	•		Ü		
Styles free					1.	ABALIA.
Styles combined					2.	PENTAPANAX.
Petals valvate in buc	i.					
Leaves digitate; st	yles ge	nerall	y free		3.	HEPTAPLEURUM.
Leaves tripinnate;	styles	alway	s free		4.	HETEBOPANAX.
Leaves simple (petals	valva	te ; st	yles co	m.		
bined)			٠.		5.	HEDERA.

1. Aralia, Linn.; G. P. n. 4.

1. A. cachemirica, Done.; Fl. Br. Ind. ii. 722; Brandis For. Flora 248, Ind. Trees 351; Gamble Man. Ind. Timb. 384. Vern. Akhōté. Jaunsar. A large perennial herb, 5-10 ft. high. Leaves 2-pinnate, or 3-pinnate, 1.5-3 ft. long. Leaflets 3-9 on each pinna (secondary pinna if 3-pinnate), 3-5 by 1.5-2.5 in., ovate or oblong-lanceolate, long-acuminate, obliquely rounded or cordate at the base, unequalsided, doubly serrate, with distant short hairs above, generally hispid on the nerves beneath; rachises hispid; petiolules 0-1.3 in.; stipules 5-1 in. long, erect, fimbriate. Flowers in umbels, which are disposed in large terminal panicles often about a foot long. Petals 5, ovate, imbricate. Stamens 5. Ovary usually 5-celled; styles 5, free above the base. Fruit with 5 stones.

Extremely common in Jaunsan and Tehri-Garhwal, above 6,000 ft., generally in shady ravines.

New shoots Apr. Fl. June-Oct.

2. Pentapanax, Seem.; G. P. n. 5.

1. **P. parasiticum,** Seem.; Fl. Br. Ind. ii. 724; Brandis Fr. Flora 248, Ind. Trees 349; Gamble Man. Ind. Timb. 384.

A scandent soft-wooded shrub with rootlets at the nodes. Leaves simply imparipinnate, 6-10 in. long. Leaflets 5, 2-3 by 1-1.7 in., ovate-lanceolate, entire, rounded or sub-acute at the base, coriaceous, glabrous, glaucous beneath; petiolules 0-1 in. Umbels 2-8 in a short panicle; pedicels 5-7 in. long, jointed below the flowers. glabrous. Flowers pentamerous. Petals imbricate. Styles 5, long, combined to near the top. Fruit small, sub-globose, obscurely 5-angled.

MUSSOORIE HILLS (Mr. P. W. Mackinnon). Very scarce.

- 3. Heptapleurum, Gærtn.; G. P. n. 23.
- 1. **H. venulosum,** Seem.; Fl. Br. Ind. ii. 729; Brandis For. Flora 249, Ind. Trees 348; Gamble Man. Ind. Timb. 386. Vern. Káth Semal, Kot Semal, Dún.

A soft-wooded scandent shrub attaching itself to trees by adventitious rootlets. Leaves digitate; petiole 6-9 in. long; stipules '3-5 in. long, connate in the angle between the branch and the petiole, amplexicaul. Leaflets 5-7, 4-8 by 2-3-5 in., the middle one largest, elliptic-oblong or lanceolate, acuminate, entire, sub-acute or rounded at the base, coriaceous, glabrous, shining above; petiolules 1-2 in. long. Flowers about '2 in. diam., cream-coloured, umbelled; umbels in large twice-compound terminal panicles; pedicels '1-3 in.; bracts

woolly, caducous. Petals 5-6, valvate. Stamens as many as the petals. Ovary with as many cells as the stamens; styles small, free. Berry 5-celled, '3-'4 in. diam., globose, smooth, yellow.

Fairly common in the Dún: Lachiwála, Dúdhli, Mothronwála, Jhájrá, etc. Also found in the Tons Valley, Jaunsab and Tehbi-Garhwal.

Fl. Jan., Feb. Fr. Apr., May.

4. Heteropanax, Seem.; G. P. n. 31.

1. H. fragrans, Seem.; Fl. Br. Ind. ii. 734; Brandis For. Flora 249, Ind. Trees 352; Gamble Man. Ind. Timb. 386. Vern. Tarlá, Dún (i.e., larger than Tarlu—Oroxylum indicum, Vent.).

A small soft-wooded tree; bark soft, even, dark brownishgrey. Leaves tripinnate, 2-4 ft. long; petiole with a swollen base; stipules minute. Leaflets 3-5 by 1.7-3 in., ovate or elliptic, shortly acuminate, narrowed at the base, entire, glabrous; petiolules 0-4 in long. Panicles about 3 ft. long, lowermost branches 1-1.5 ft., branchlets or umbel-bearing racemes 2-3 in., umbels sub-capitate. Flowers '2-'3 in. diam., polygamous, small, yellow, fragrant. Calyx nearly truncate. Petals 5, valvate. Stamens 5. Ovary 2-celled; styles 2, distinct, filiform. Fruit compressed, '2-'3 in. long, '3-'4 in. broad, '1 in. thick; seeds 2, flat, orbicular.

Fairly common in the Dún and also in the Saháranpur Siwaliks: Kánsráo Pass, Tháno, Lachiwála, Dúdhli, Phandowála, Karwápáni; Sháhjahánpur Ráu, etc. The tree is likely to be mistaken, when not in flower and fruit, for *Oroxylum indicum*, Vent., which, however, has opposite leaves.

The leaves are lopped for cattle-fodder, and the Eri silkworm of Assam is sometimes fed on them.

Fl. Jan., Feb. Fr. Feb., Mar.

5. Hedera, Linn.; G. P. n. 35.

1. **H. Helix,** Linn.; Fl. Br. Ind. ii, 739; Brandis For. Flora 248, Ind. Trees 349; Gamble Man. Ind. Timb. 387. The Ivy. Vern. *Mithiári*, Jaunsar.

A large evergreen woody climber adhering to trees, rocks or walls by numerous fine adventitious rootlets. Leaves simple, extremely variable in size and shape, generally 2.5 in. long, often variously lobed, leathery, dark-green and shining above; margins entire; base cordate rounded or cuneate; petiole slender, '5-2.5 in. long. Flowers polygamous, yellowish-green, in pedunculate globose umbels, which

again are arranged in sub-corymbose panicles; peduncles 1-2 in., pedicels '5-'8 in. long, both clothed with minute stellate scales. Calyx 5-toothed or nearly entire. Petals 5, valvate. Stamens 5. Ovary 5-celled; styles connate in a short column. Fruit '25-'3 in. diam., globose, yellow, turning black when fully ripe, shining; seeds 3-4, ovoid.

Common in Jaunsar and Tehri-Garnwal, up to 9,500 ft. Also found in the Nakraunda, Mothronwála and Kánsráo swamps in the Dón, 1,400-1,800 ft.

Wood light-grey or yellow, soft and porous; annual rings distinct; weight 35 lbs. per c. ft. The leaves are a favourite fodder for sheep.

Fl. Oct.-Apr. Fr. Jan.-June.

FAM. 43. CORNACEÆ; G. P. N. 82.

Shrubs or trees. Leaves simple, opposite or alternate, usually entire, frequently unequal at the base; stipules none. Flowers regular, in axillary or terminal heads cymes or panicles. Calyx-tube adnate to the ovary; limb truncate or 4-5-toothed, persistent. Petals 4-5, valvate, or none. Stamens inserted with the petals and generally equal to them in number. Disk epigynous. Ovary inferior, 1-4-celled; style single; ovules pendulous, usually solitary. Fruit usually a succulent drupe with a 1-4-celled kernel, less often with two distinct stones; seeds pendulous, oblong, albuminous.

Analysis of the Genera.

(Adopted from Brandis' For. Flora, p. 250.)

Leaves alternate; petals, anthers and style long.
Flowers fasciculate; stamens numerous . . 1. ALANGIUM.
Flowers paniculate; stamens as many as the petals 2. MARLEA.

Leaves generally opposite; petals, anthers and style short 3. CORNUS.

1. Alangium, Lamk.; G. P. n. 1.

1. **A. Lamarckii**, Thwaites; Fl. Br. Ind. ii. 741; Brandis For. Flora 250, Ind. Trees 354; Gamble Man. Ind. Timb. 389. Vern. *Akolá*, *Ankora*, Hind.; *Bismár*, Saháranpur.

A shrub or small tree, almost evergreen; branchlets spinescent; bark grey. Leaves alternate, simple, 3-6 in. long, membranous varying in shape from linear oblong to elliptic, obtuse acute or acuminate, glabrous or nearly so; lateral nervos 5-8, fine; base acute or rounded; petiole 2-5 in. long, hairy. Flowers 6-8 in. long, white, fragrant, solitary or fascicled; inflorescence and calyx woolly. Calyx minutely 6-10-toothed. Petals 5-10, nearly 1 in. long, silky outside. Slamens up to 30, short, hairy; anthers very long. Ovary inferior, 1-celled; style long, filiform. Fruit a berry, 7 in. long, ellipsoidal, crowned with the enlarged calyx-limb, quite smooth, black outside when ripe, filled with a red pulp; endocarp bony; seeds oblong.

Occasionally met with along the foot of the Saháranpur Siwaliks: Ráuņli, Ránipur, Jawálápur, etc. Not found in the Dún.

Wood light-brown, fine-and smooth-grained, very tough and strong; weight 45-56 bs. per c. ft. Used for pestles for oil-mills, wooden cattle-bells, carrying-poles and yokes. The bitter bark of the roots is used in country medicine, and the leaves often as poultice. The fruit is eaten, and an oil is extracted from the seeds which is used in medicine and also for burning.

New leaves Apr., May. Fl. Feb.-Apr. Fr. May-Aug.

2. Marlea, Roxb.; G. P. n. 2.

1. **M. begoniæfolia**, Roxb.; Fl. Br. Ind. ii. 743; Brandis For. Flora 251, Ind. Trees 355; Gamble Man. Ind. Timb. 389. Vern. Bhút Kainju, Jaunsar; Garh Kimu, Dún.

A small tree with smooth grey bark; branches horizontal; young parts pubescent. Leaves alternate, simple, 3-10 in. long, varying from orbicular to broad-oblong, acuminate, distantly angular-lobed or quite entire, usually glabrous above when mature; base unequal, from cuneate to deeply cordate, with 3-5 basal nerves; petiole 1-1.5 in. long. Flowers bracteate, 6-9 in. long, 2-sexual, white, in axillary dichotomously-compound cymes. Calyx shortly toothed. Petals usually 6-8, strap-shaped, 5-7 in. long, white, slightly hairy.

Stamens 6-8; filaments short, hairy; anthers '4 in. long, linear. Ovary usually 2-celled; ovules 2, pendulous; style long, glabrous; stigma capitate. Fruit a drupe, '3-5 in. long, ovoid, obscurely ribbed, glabrous, crowned with the presistent calyx-limb still encircling the disk; seeds oblong, compressed.

Valleys up to 5,000 ft. in Jaunsar and Tehri-Garhwal, and in the Outer Himalayan Hills: Binálgádh, Thádiár; Paléd, above Rájpur, etc. Also in the Nakraunda swamp in the Dún, 1,900, ft.

The wood is even-grained, white and soft, used in building huts in Sylhet. The leaves are given as fodder to sheep and cattle. Lac is sometimes grown on it in Kámrúp, Assam.

Fl. Mar-May. Fr. July-Oct.

3. Cornus, Linn.; G. P. n. 5.

Trees or shrubs. Leaves entire, usually opposite. Flowers small, bisexual, in cymes or heads. Calyx 4-toothed; tube campanulate or urn-shaped. Petals 4. oblong, valvate. Stamens 4, alternating with the petals; anthers oblong, versatile. Ovary usually 2-lobed; ovules solitary, pendulous; style short, club-shaped. Fruit a 2-celled, 2-seeded drupe; endocarp bony.

Analysis of the Species.

Flowers in compound cymes, without bracts;
drupes free.

Leaves broad-ovate, glabrous and glaucous
beneath 1. C. macrophylla.

Leaves narrow-oblong, glabrous or minutely hairy and green beneath . 2. C. oblonga.

Flowers in dense heads subtended by 4 large
white bracts; drupes confluent . 3. C. capitata.

1. **C. macrophylla,** Wall.; Fl. Br. Ind. ii. 744; Brandis For. Flora 252, Ind. Trees 355; Gamble Man. Ind. Timb. 390. Vern. Kágshi, Khágsha, Khákshá, Jaunsar. A middle-sized tree with rough brown bark and horizontal branches. Leaves opposite, rarely a few alternate, 6 by 4 in., ovate, sometimes unequally divided by the midrib, acuminate, glabrescent above, glaucous beneath; lateral nerves 5-8 pairs, arcuate; base subacute rounded or rarely slightly cordate; petiole 1 in. Panicles terminal, with several pairs of usually-opposite branches and dichotomous branchlets bearing cymes. Calyx-tube urn-shaped, covered with white adpressed hairs. Petals 2-3 in. long, strap-shaped, valvate, hairy outside. Drupe globose, 22 in. long, crowned with the remains of the calyx-tube and the disk.

Fairly common in JAUNSAR and TEHRI-GARHWAL, 4,-8,000 ft., especially in shady depressions: Chakrata, Lokhár, Kathián, Dhármigádh Valley; Deotá, Kúlni, etc.

Wood pinkish-white, hard, close-grained but warps badly, noted as yielding excellent charcoal for gun-powder; weight about 45 lbs. per c. ft. The leaves are lopped for goat-fodder and the fruit is eaten.

Fl. Apr., May. Fr. June, July.

2. C. oblonga, Wall.; Fl. Br. Ind. ii. 744; Brandis For. Flora 253, Ind. Trees 355; Gamble Man. Ind. Timb. 390. Vern. Korh.i, Jaunsar.

A small tree with reddish-brown rough bark. Leaves opposite. sometimes a few alternate, 2-6 by '7-1'5 in., narrowly oblong or elliptic, narrowed at both ends, sub-coriaceous, glabrescent above; lateral nerves 3-7 pairs, arcuate, prominent below, often glandular at the axils; petiole '2-'6 in. long. Panicle of cymes terminal, pubescent. Calyx-tube campanulate, slightly hairy. Petals about '2 in. long, almost glabrous. Drupe ovoid, about '3 in. long, crowned as in the last species.

OUTER HIMALAYAN HILLS, JAUNSAR and TEHRI-GARHWAL, 3,-7,000 ft.: Mussoorie, Láduakót; Korwá, Kathián; Bámsu, etc.

Wood pinkish-white, hard and even-grained, warps in seasoning. Weight 46-50 lbs. per c. ft.

Fl. Sept.-Dec. Fr. Jan.-Apr.

3. **C. capitata**, Wall.; Fl. Br. Ind. ii. 745; Brandis For, Flora 253, Ind. Trees 356; Gamble Man. Ind. Timb. 391. **Vern.** *Thanboi.*, Jaunsar; *Bhamorá*, Garhwal.

A small deciduous tree with greyish-brown bark; young branches and leaves rough with short adpressed hairs. Leaves opposite, approximate at the ends of the branchlets, 2-3.5 by 1.2-1.5

in., oblong or elliptic, coriaceous, pale beneath, lateral nerves usually 4 pairs, arouate; petiole 5 in. long, channelled, with a broad base. Bracts 4, 1 by 8 in., white or yellowish. Heads hemispherical, 5 in. diam. Flowers small, closely packed in the head. Calyx-teeth reflexed. Fruits coalesced in a fleshy strawberry-like head 1 in. diam.; endocarp solitary, about 15 in. long, 1-seeded, bony, compressed, angular.

JAUNSAR and OUTER HIMALAYA, from 3,500 to 8,000 ft. Soitoli, Dhárágádh, Kathián, Nágthát; below Mussoorie, etc.

Wood very hard and close-grained, but warps in seasoning. Weight 45 lbs. per c. ft. Used chiefly for fuel. The fruit when ripe is red, and is eaten and made into preserves.

Fl. Apr.-Oct. Fr. Nov.-Jan.

GAMOPETALÆ.

Series i.-Epigynæ.

Order 1.—RUBIALES.

FAM. 44. CAPRIFOLIACEÆ; G. P. N. 83.

Shrubs or small trees, rarely herbs. Leaves opposite or ternate; stipules generally absent. Flowers bisexual, regular or irregular. Calyx-tube adnate to the ovary; limbs 3-5-lobed. Corolla gamopetalous, often 2-lipped; lobes 5, imbricate in bud. Stamens 5, rarely fewer or more, inserted on the corolla-tube between the lobes; anthers versatile. Ovary inferior, 1-6-celled; ovules solitary and pendulous, or several on axile placentas. Fruit a berry or a drupe, rarely a capsule; seeds with copious fleshy albumen.

Analysis of the Genera.

Corolla-tube straight, limb not lipped.
Fruit 1-seeded; stem solid.

Leaves generally toothed or serrate; calyxlobes not elongated . . . 1. VIBURNUM.

Leaves entire; calyx-lobes elongated
and feathery 2. ABELIA.

Fruit many-seeded; stem hollow . 4. LEYCESTERIA.

Corolla-tube oblique, limb more or less lipped
(fruit many-seeded; leaves entire) . 3. LONICERA.

1. Viburnum, Linn.; G. P. n. 3.

Shrubs or small trees. Leaves simple, opposite, sometimes ternate, generally serrate or toothed. Flowers

white or pink, in terminal or axillary corymbs or panicles. Calyx-limbs short, 5-toothed. Corolla 5-lobed. Stamens 5. Ovary 1-3-celled with 1 pendulous ovule in each cell; style short, or stigma sessile. Fruit a drupe, usually 1-celled, 1-seeded.

Analysis of the Species.

Flowers in corymbs, appearing with or after the leaves.

Leaves serrate.

Leaves obtuse, woolly beneath . 1. V. cotinifolium.

Leaves acuminate, stellate-pubescent beneath . 2. V. stellulatum.

Leaves entire, glabrous . . 3. V. coriaceum.

Flowers in panicles, appearing before the leaves.

Corolla-tube less than half an inch long; adult leaves hairy beneath . 4. V. nervosum.

Corolla-tube half an inch or more; adult leaves glabrous 5. V. totens.

1. V. cotinifolium, Don; Fl. Br. Ind. iii. 3; Brandis For. Flora 358, Ind. Trees 361; Gamble Man. Ind. Timb. 393. Vern. Bhutnoi, Jaunsar.

A large deciduous shrub with greyish bark. Leaves 3-3.5 in. long, ovate elliptic or orbicular, obtuse, crenulate or nearly entire, rugose, woolly beneath; base obtuse or subcordate; lateral nerves 5-6 pairs, branching. Flowers generally in dense terminal corymbs which are 3-4 in. diam.; bracteoles linear. Calyx-lobes short. Cerolla-tube '2 in. long, turbinate, white tinged with pink; lobes round. Style very short, conical. Drupe '3 in. long, oblong, compressed, ribbed, red.

Abundant in Jaunsar and Tehri-Garhwal, above 4,000 ft., affecting open sunny aspects.

Wood white, hard and close-grained. The ripe fruit is eaten. Fl. Apr -June. Fr. July, Aug.

2. V. stellulatum, Wall.; Fl. Br. Ind. iii. 4; Brandis For. Flora 258, 576, Ind. Trees 361; Gamble Man. Ind. Timb. 394. Vern. Richhoi, Jaunsar.

A shrub with long branches, and dark-grey almost black bark. Leaves 3-4 by 1.5-2 in., ovate or ovate-lanceolate, long-acuminate, distantly sharp-toothed, membranous, glabrous above, sparingly stellulate-pubescent beneath; base rounded or subacute; petiole 3-1 in. long. Flowers small, very numerous, in large bracteate umbellate cyme-bearing terminal corymbs. Calyx-tube stellately hairy. Corolla rotate, white, pubescent; lobes round. Drupe 25 by 2 in., broadly oblong, compressed, bright-red when ripe.

Fairly common in Jaunsar and Tehri-Garhwal, above 6,000 ft., generally in cool shady localities: Deoban, Mundáli; Deotá, etc.

Walking-sticks are often made of the branches. The acid fruit is eaten.

Fl. July, Aug. Fr. Sept., Oct.

3. V. coriaceum, Bl.; Fl. Br. Ind. iii. 5; Brandis For. Flora 259, Ind. Trees 362; Gamble Man. Ind. Timb. 394. Vern. Rashniá. Jaunsar.

A shrub or small tree with grey bark. Leaves 4-9 by 1.5.2.5 in., oblong, acuminate, entire, thickly coriaceous, glabrous; lateral nerves 3-4 pairs, arcuate; petiole 5-1 in. long. Flowers 25 in. long, numerous, in terminal umbellate corymbs; bracts 0. Calyxtube truncate, glabrous. Corolla white, tubular. Drupe 2 in. long, 1-celled, black.

JAUNSAR and TEHRI-GARHWAL, 4,-7,000 ft.; also the OUTER HIMALAYA: Korwá forest, Kathián, Moltá; both slopes of the Mussoorie Hill, Málköt Forest, etc.

Wood white, hard, close-grained, weighing 50 lbs. per c. ft. An oil is said to be extracted from the seeds in Nepal.

Fl. May, June. Fr. July, Aug.

4. V. nervosum, Don; Fl. Br. Ind. iii. 8; Brandis For! Flora 259, Ind. Trees 363; Gamble Man. Ind. Timb. 395. Vern. Tirnoi, Jaunsar.

A shrub with stout grey or brownish branches. Leaves 2:5-4 by 1:3-1:5 in., elliptic-oblong, acute, serrate, glabrous above, hairy on the nerves beneath; lateral nerves 8-10 pairs, prominent, closely parallel; base cuneate; petiole 3-6 in. long. Panicles compact, silky; branches short. Calyx-tube glabrous. Corolla-tube 3-5 in. long; lobes elliptic, light-rosy. Stamens in 2 series, 2 above and 3 below. Drupe ellipsoid, up to 3 in. long.

Tehri-Garhwal Forests, above 9,000 ft.; Rikhshin. Rather scarce.

Fl. Apr., May. Fr. May, June.

5. **V. foetens**, Done.; Fl. Br. Ind. iii. 8; Brandis For. Flora 259, Ind. Trees 364; Gamble Man. Ind. Timb. 395. Vern. *Timoi*. Jaunsar.

A shrub very closely resembling the last species. Leaves about 4 in. long, elliptic or oblong, serrate, glabrous, emitting a strong unpleasant smell; nerves 7-9 pairs, distantly parallel. Panicles lax; branches glabrous or nearly so. Flowers sweet-scented. Corollatube: 5:-7 in. long; lobes rosy. Stamens in two series. Drupe up to 5 in. long, ellipsoid, red.

Fairly common in Jaunsar and Tehri-Garhwal, above 8,000 ft.: Deoban, Mundáli; Deotá, etc.

The fruit is said to be edible.

Fl. May, June. Fr. July, Aug.

2. Abelia, R. Br.; G. P. n. 7.

1. **A. triflora**, R. Br.; Fl. Br. Ind. iii. 9; Brandis For. Flora 257, Ind. Trees 360; Gamble Man. Ind. Timb. 396. Vern. *Máli*, *Málē*, Jaunsar.

A large shrub; branches long, fluted; branchlets slender and often drooping; bark grey. Leaves 2-3 by 7-1·3 in., ovate-lanceolate, hairy all over or only along the margins and the midrib, finely reticulate; petioles short, often connate at the base. Flowers scented, '4·6 in. long, usually 3 together in dense bracteate heads or cymes; bracts and bracteoles foliaceous. Calyx-lobes '5-1 in. long in fruit, feathery, with a distinct midrib. Corolla tubular, funnel-shaped or with a wide mouth, pinkish-white. Fruit '2-'3 in. long, 1-seeded, linear-oblong, dry.

Fairly common in Jaunsar and Tehri-Garhwal, above 4,000 ft., frequently on calcareous soils: Deoban, Bodyár, Mundáli, Dhárágádh; Bámsu, Deotá, etc.

Wood bluish-white, hard, close-and even-grained; weight 65 lbs. per c. ft. Walking-sticks are often made of the branches, and the leaves are browsed by goats.

Fl. May-July. Fr. July-Oct.

3. Lonicera, Linn.; G. P. n. 9.

Shrubs, erect or scandent. Leaves opposite, entire. Flowers in peduncled pairs, often connate by their ovaries,

supported by bracts and bracteoles; peduncles axillary or subterminal. Calyx-tube ovoid; limb short, 5-toothed. Corolla tubular, limb oblique or 2-lipped, 5-lobed. Stamens 5. Ovary 2-3-celled; ovules many in each cell, in double rows; style slender, stigma capitate. Fruit a fleshy berry, often two connate into one, 2-3-celled; seeds few in each cell; albumen fleshy.

Analysis of the Species.

Corolla not distinctly 2-lipped.

Leaves oblong; fruit black . . 1. L. purpurascens. Leaves lanceolate; fruit red . . 2. L. angustifolia.

Corolla distinctly 2-lipped.

Fruits free.

Peduncles extremely short . . 3. L. quinquelocularis.

Peduncles 1-2 in. long. 5. L. alpigena. Fruits confluent 4. L. orientalis.

1. L. purpurascens, Hook. f. & T.; Fl. Br. Ind. iii. 12; Brandis For. Flora 255, Ind. Trees 359; Gamble Man. Ind. Timb. 396.

A small shrub; branches dark-grey; bark peeling off in thin shreds. Leaves 1 5 by 5 in. or less, oblong or obovate-oblong, pilose or glabrescent above, usually villous beneath. Bracts linear. Corolla 5.7 in. long, hairy, purple, funnel-shaped. Style hairy. Fruit globose, black when ripe.

TEHRI-GARHWAL, above 10,000 ft.: Rikhshin, Chánsil, etc.

Fl. May, June.

2. **L. angustifolia**, Wall.; Fl. Br. Ind. iii. 13; Brandis For. Flora 255, Ind. Trees 359; Gamble Man. Ind. Timb. 397. Vern. Geáng, Chalú, Pirlú, Banchulú, Jaunsar.

A small shrub with smooth grey bark which exfoliates in long papery flakes. Leaves 1.5 by 5 in., lanceolate or oblong-lanceolate, pale and nearly glabrous beneath. Flowers in pairs on slender axillary peduncles 5.1 in. long; bracts linear; bracteoles connate, enclosing the confluent ovaries. Corolla white tinged with rose, e2.4 in. long, scented; lobes subequal. Style short, glabrous. Fruit confluent, globose, bright ruby-colour and translucent when ripe; seeds few.

Common in Jaunsar and Tehri-Garhwal, above 6,000 ft.

Wood hard and very close-grained. Good walking-sticks can be made of the branches, if found long and thick enough. The fruit is sweetish and is greedily eaten by the hill people.

Fl. May, June. Fr. July, Aug.

3. L. quinquelocularis, Hardwick; Fl. Br. Ind. iii. 14; Brandis For. Flora 255, Ind. Trees 359; Gamble Man. Ind. Timb. 397. The Himalayan Honey-suckle. Vern. Taknoi, Jaunsar.

A large shrub, occasionally a small tree; bark grey, with longitudinal fissures, peeling off in long shreds; branchlets pubescent. Leaves 1.5.3 by 1.2 in., obovate or ovate-lanceolate, acute or obtuse at either end, glabrate above, pilose beneath. Flowers clustered, axillary; peduncles extremely short; bracts linear, ciliate; bracteoles obtuse, connate at the base. Calyx-limb cup-shaped, hairy. Corolla '7-1'2 in. long. white, fading into pale-yellow, hairy. Style hairy, exserted. Berries not connate, brownish-black when ripe.

Fairly common throughout the OUTER HIMALAYA, JAUNSAR and TEHRI-GARHWAL, 2.500-9,000 ft.

Wood greyish-white, hard and close-grained; takes a fine polish, but is used chiefly for fuel; weight 52 lbs. per c. ft. Cattle are fed on the leaves. The branches are sometimes used for walking-sticks.

Fl. May, June. Fr. July, Aug.

4. L. orientalis, Lamk.; Fl. Br. Ind. iii. 15; Brandis For. Flora 256, Ind. Trees 359; Gamble Man. Ind. Timb. 398. Vern. Taknoi, Jaunsar.

A large shrub with compressed horizontal branches; bark peeling off in thin shreds. Leaves 2-4 by 1.5-2.5 in., ovate or ovatelanceolate, acute at both ends, mucronate, more or less pubescent beneath; nerves 10-12 pairs, slender. Peduncles 5-1 in. long, thickened upwards; bracts linear-lanceolate; bracteoles small and rounded, or none. Calyx-lobes linear-lanceolate. Corolla pink, nearly glabrous outside, deeply 2-lipped, gibbous at the base; tube very short. Style hairy. Berries confluent, black when ripe.

JAUNSAR and TEHRI-GARHWAL, above 6,000 ft.; Mundáli, Deoban, etc.

Fl. June. Fr. July, Aug.

5. L. alpigena, Linn.; Fl. Br. Ind. iii. 15; Brandis For. Flora 256, Ind. Trees 358; Gamble Man. Ind. Timb. 398. Vern. Phulor, Jaunsar.

A shrub with pubescent branchlets, and grey-brown bark which peels off in irregular papery flakes. Leaves 3-4 by 1-2 in.

elliptic-oblong or ovate-lanceolate, long-acuminate, glabrate above, pilose beneath; base rounded or cuneate; nerves 6-8 pairs, slanting. Peduncles 1-2 in. long, thickened upwards; bracts lanceolate or linear; bracteoles small. Calyx-tube pubescent; limb short. Corolla glandular-hairy, very gibbous at the base. Fruit not connate

JAUNSAR and TEHRI-GARHWAL, above 8,000 ft., not common: Bájámárá, Mundáli; Deotá, Rikhshin, etc.

Fl. May, June. Fr. July, Aug.

4. Leycesteria, Wall.; G. P. n. 10.

L. formosa, Wall.; Fl. Br. Ind. iii. 16; Brandis For. Flora 56, Ind. Trees 360; Gamble Man. Ind. Timb. 398. Vern. Bhúj-nali, Jaunsar; Dándá Bhekar, Garhwal.

A bushy shrub (perennial herb?) with grey stems and deepgreen hollow branches, usually from near the base. Leaves opposite, 2-5 by 1-3 in., ovate or ovate-lanceolate, long-acuminate, entire or with the margins irregularly uneven, membranous, glaucous or puberulous beneath, glabrous or slightly scabrous above; base from subacute to cordate; petioles '2-1 in. long, connate at the base. Flowers about 1 in. long, sessile, in axillary or terminal bracteate whorls; bracts sessile, greenish-purple, ovate or ovate-lanceolate, generally connate at the base; bracteoles very variable. Calyx-lobes 5, unequal, persistent. Corolla funnel-shaped, swollen at the base, red or white with a purplish tinge. Fruit a fleshy berry, '5 in. long, subglobose, dark-purple when fully ripe, glandular-hairy, usually 5-celled, many-seeded. Seeds round and compressed.

Fairly common in cool shady forests in JAUNSAR: Deoban, Mundáli, etc.

The hollow stems are made into toy flutes and trumpets by Jaunsari shepherd boys.

Fl. June, July. Fr. July, Aug.

FAM. 45. RUBIACEÆ; G. P. N. 84

Trees, shrubs or herbs. Leaves simple, opposite or whorled, entire, stipulate; stipules inter- or intra-petiolar, free or adnate to the petioles, or forming a sheath round the stem. Inflorescence various. Calyx-tube adnate to

the ovary; limb entire or toothed. Corolla gamonetalous, regular; lobes usually 4-5, valvate imbricate or contorted in the bud. Stamens as many as the corollalobes and alternating with them, inserted on the corollatube. Ovary inferior, 2- or more-celled, rarely 1-celled; ovules 1 or more in each cell, anatropous. Fruit various; seeds usually with a fleshy or horny albumen.

Analysis of the Genera.

Fruit capsular. Ovary 2-celled, cells many-seeded. Corolla-lobes valvate in bud. Flowers in dense globose heads. Calyx 5-lobed; no bract-like leaves . 1. ADINA. Calvx truncate: inflorescence supported by bract-like leaves . 2. STEPHEGYNE. Flowers in panicled spikes supported by large leafy bracts . . . 3. Hymenodictyon. Corolla-lobes imbricate in bud; flowers . 4. WENDLANDIA. in large terminal panicles Ovary 5-celled, seeds solitary in each cell: corolla-lobes valvate in bud. Capsule 1-celled, 5-valved only at the top; bracteoles free . . . 9. Hamiltonia. Capsule 5-celled to the base; bracteoles . 10. LEPTODERMIS. connate Fruit indehiscent; ovary 2-celled; corrolla lobes twisted in bud. Fruit with a pair of 1-seeded crustaceous pyrenes. Flowers in trichotomous corymbose . 7. PAVETTA. panicles Flowers axillary, fascicled or solitary . 8. Coffea. Fruit fleshy, seeds more than 1 in each cell (flowers axillary, fasciled or solitary). Ovary 2-celled; placentas on the septum 5. RANDIA. Ovary 1-celled: placentas parietal . 6. GARDENIA.

1. Adina, Salisb.; G. P. n.

1. A. cordifolia, Hook, f.; Fl. Br. Ind. iii. 24; Brandis For. Flora 263, Ind. Trees 368; Gamble Man. Ind. Timb. 401. Vern. Haldú, Hind.

A large deciduous tree, often buttressed; bark grey or brownish-grey, rough, inner substance reddish-brown with streaks of white. Leaves opposite, 4-9 in. diam., orbicular, cordate, abruptly acuminate, coriaceous, glabrate above, pubescent beneath; petiole 3-4 in. long; stipules '5-'8 in. long, triangular, elliptic or obovate, brown, concealing the uppermost pair of leaf-buds. Flowers yellow, downy, bracteolate, in globose peduncled heads which are '7-1 in. diam.; receptacle hairy; peduncles axillary, 2-4 in. long, usually with one head. Calyx-tube 5-angled; limb 5-lobed. Corolla trumpet-shaped; tube long glabrous inside; lobes valvate. Stamens 5, inserted in the mouth of the corolla-tube; filaments short. Ovary 2-celled; ovules many in each cell; style filiform, long-exserted. Capsules 200-300 in each head, of 2 dehiscent cocci, dry, many-seeded; seeds oblong, winged, very minute.

A common tree throughout the Dún and Saháranpur Forests and in the Outer Himalaya, usually overtopping all other trees, and can be easily recognized from a distance by its dark-green umbrageous crown.

Wood yellow when fresh-cut, afterwards changing into reddish-brown, even-grained, compact, moderately hard; weight 40-50 lbs. per c. ft.; heartwood and annual rings not distinct. It seasons well, works easily, takes a good polish and is fairly durable. Used for construction, furniture and agricultural implements. In the SIWALIK DIVISION there is a special demand for good trees, which are carted down to Saháranpur to be made into combs, writingtablets and ornamental platters.

Leafless for a short time in May. Fl. June, July. Seeds ripen in the cold season.

2. Stephegyne, Korth.; G. P. n. 5.

1. **S. parvifolia**, Korth.; Fl. Br. Ind. iii. 25; Brandis For. Flora 262, Ind. Trees 369; Gamble Man. Ind. Timb. 403. Vern. Káem, Hind.; Phaldú, Garhwal.

A large deciduous tree; trunk irregularly shaped, often buttressed; bark brownish or greenish-grey, smooth, with shallow depressions left by exfoliating scales. Leaves opposite, very variable, 2-6 in. long, orbicular oblong ovate or obovate, coriaceous, glabrous or pubescent; lateral nerves 6-8 pairs, oblique; base cuneate to subcordate; stipules obovate, pale, membranous. Flowers white or light-yellow, bracteolate, glabrous inside, in globose heads about 1 in. diam. Peduncles '5-3 in. long, simple or trichotomously divided to form usually 3-headed napicles, supported by a pair of bract-like

oblong leaves narrowed into a long slender petiole; bracteoles spathulate, minute. Calyx-tube short; limb truncate or minutely 5-toothed. Corolla trumpet-shaped; lobes 5, valvate. Stamens 5, inserted on the throat of the corolla-tube; filaments short. Ovary 2-celled; ovules many in each cell; style filiform, much exserted; stigma cylindrical, with a concave base. Capsules 100-150 in each head, dry, '12 in. long, of 2 dehiscent cocci; seeds many, winged, minute.

Abundant in the Saháranpur Forests, and fairly common in the Dún. Some individuals attain enormous sizes, e.g., those in the camping-ground at Dholkhand.

Wood light pinkish-brown, close- and fine-grained, generally harder than that of Adina cordifolia; weight about 42 lbs. per c. ft. Heartwood not distinct; rings visible. Used generally for the same purposes as Haldú. The leaves are used for fodder.

Leafless Apr., May. Fl. June, July. Fr. Nov.-Jan.

Allied to the two preceding trees is Anthocephalus Cadamba, Miq.; Fl. Br. Ind. iii. 23. Vern. Meo, E. Dén;—a large handsome tree, a few individuals of which, probably originally planted, are found near the old Khairi fort, E. Dén. Leaves resembling those of Holarhena antidysenterica. Flower-heads about 2 in. diam. The ripe fruit is acid and is eaten raw or cooked.—G. P. n. 2.

3. Hymenodictyon, Wall.; G. P. n. 19.

1. **H. excelsum**, Wall.; Fl. Br. Ind. iii. 35; Brandis For. Flora 267, Ind. Trees 371; Gamble Man. Ind. Timb. 406. Vern. *Bhaulan*, Dún; *Kúkurkát*, Hind.

A large deciduous tree; bark soft, brownish-grey, smooth on branches and poles, corky and furrowed on the stems of mature trees. Leaves opposite, 4-10 by 3-5 in., elliptic or obovate-oblong, acuminate, often obtuse or rounded, membranous, pubescent; lateral nerves 7-10 pairs; base acute; petiole 1-3 in.; stipules oblong with a broad base, caducous, usually glandular-serrate; floral leaves long-petioled, strongly nerved. Flowers about '2 in. long, white, fragrant, in large terminal panicles with bracteate spicate branches; pedicels very short; bracts large, leafy, persistent. Calyx-tube short; lobes 5-6, deciduous. Corolla '2 in. long, funnel-shaped, pilose outside; lobes 5, short, valvate. Stamens 5; flaments dilated upwards; anthers linear. Ovary 2-celled; ovules numerous; style long-exserted; stigma spindle-shaped. Fruit a loculicidally dehiscent capsule, '5-7 in. long, on short recurved pedicels, ellipsoid, 2-valved,

many-seeded; seeds flat, lenticular, winged all round the margin, '3 by '1 in. including the wing.

Not uncommon in the Sal forests of the Din although rare in the Western Din, and frequently met with in the better class of Saharanpur Forests: Phandowala, Lachiwala, Thano; Mohand, etc.

Wood brownish-grey, close-grained but light and soft; heartwood not distinct; weight about 30 lbs. per c. ft. Used for agricultural implements, palanquins, scabbards, toys and similar other articles. The bark is used for tanning and as a febrifuge, and the leaves as cattle-fodder.

Leafless Nov.-May. Fl. June-Aug. Fr. Cold season.

4. Wendlandia, Bartl.; G. P. n. 62.

Shrubs or small trees. Leaves opposite or ternately whorled. Flowers small, white or rosy, in terminal panicled cymes, 2-3-bracteolate. Calyx-lobes 4-5, subequal, persistent. Corolla tubular or funnel-shaped; lobes 4-5, imbricate in bud. Stamens 4-5, between the corolla-lobes; anthers exserted. Ovary usually 2-celled; cells many-seeded; style slender; stigma entire or bifid. Capsule globose, 2-valved, many-seeded; seeds very minute, obscurely winged.

Analysis of the Species.

Stipules recurved; leaves at least three times as long as broad; lateral nerves 12-20 pairs . Stipules erect; leaves about twice as long as

broad: lateral nerves 10-12 pairs . . 2. W. puberula.

1. **W. exserta,** DC.; Fl. Br. Ind. iii. 37; Brandis For. Flora 268, Ind. Trees 373; Gamble Man. Ind. Timb. 408. Vern. Bathúá, E. Saháranpur; Chaulái, W. Saháranpur.

A small deciduous tree; bark rough, brown, longitudinally cracked and exfoliating in long strips; branchlets, leaves and inflorescene grey-tomentose. Leaves 4-9 by 1-3 5 in., ovate ovate-lanceolate or narrow-oblong, finely acuminate, coriaceous, sometimes glabrate above, often densely pubescent beneath; lateral nerves

12-20 pairs, parallel; petiole '5-1 in. long; stipules interpetiolar, ovate, acute, recurved. Flowers sessile, '15 in. diam., dull-white, fragrant, in cymes which again are disposed in large very dense conical terminal panicles much exceeding the leaves. Calyx-lobes 4-5, ovate or subulate, persistent. Corolla funnel-shaped; lobes imbricate in bud. Anthers versatile, exserted. Ovary 2-celled. Capsules '1 in. long, white-tomentose.

Very common in the SIWALIK TRACTS, especially along the passes and on land-slips; also found in the Tons Valley; from Kálsi to Thadiár.

Wood reddish-brown, hard and close-grained; weight 47 lbs. per c. ft. It is used for building and agricultural implements.

Fl. Mar., Apr. Fr. Rainy season.

2. W. puberula, DC.; Fl. Br. Ind. iii. 37; Brandis For. Flora 576, Ind. Trees 373; Gamble Man. Ind. Timb. 408.

A small deciduous tree with rough brownish-grey bark; innovations puberulous. Leaves 4-8 by 2.5-4 in., elliptic or oblong, acute, less frequently acuminate, rather membranous, glabrous above except along the nerves, with brown pubescence along the midrib and nerves beneath; lateral nerves 10-12 pairs, less prominent than in the other species; base acute; petiole '3-'7 in. long; stipules '2-'3 in. long, usually caudate-acuminate, erect, persistent. Flowers sessile, very small, bluish-white, in terminal and axillary panicles which are generally shorter than the leaves. Calyx hairy; lobes triangular. Corolla funnel-shaped; lobes shorter than the tube. Capsules about '1 in. long, nearly glabrous.

Fairly common along banks of streams in the Tons Valley, Jaunsar and Tehri-Garhwal, up to 4,000 ft.: Dhármigádh; Thadiár, Sendrá, etc. Also Sansáru Khálá, Málköt.

Fl. May, June. Fr. Dec.-Jan.

5. Randia, Linn.; G. P. n. 166.

Shrubs or trees, often spinous. Leaves opposite or falsely alternate; stipules intrapetiolar, short. Flowers white, fading to yellow, solitary fascicled or corymbose, usually axillary. Calyx-limb tubular; lobes long or short. Corolla-tube usually cylindrical, long or short; lobes usually 5, twisted in bud. Stamens 5; anthers subsessile, narrow. Ovary generally 2-celled; ovules

usually numerous, on fleshy placentas; style entire or bifid. Fruit a succulent berry, 2-celled, generally many-seeded; seeds angular.

Analysis of the Species.

A small shrub. Fruit '3 in. long, 4-seeded 1. R. tetrasperma. Small trees. Fruit 1-2 in. long, many-seeded.

Spines short, at the ends of the branchlets:

corolla glabrous outside . 2. R. uliginosa. Spines long, axillary; corolla hairy outside . 3. R. dumetorum:

1. R. tetrasperma, Benth. & Hook., f.; Fl. Br. Ind. iii. 109; Brandis For. Flora 272, Ind. Trees 381; Gamble Man. Ind. Timb. 412. Vern. Bhedrá, Dánwá, Chhotá Gingárú, Jaunsar.

A small shrub with stiff grey branches and branchlets. Leaves crowded at the ends of the branchlets. 5-2 in. long, obovate or oblanceolate, narrowed into a short petiole, glabrous; stipules small. Flowers sessile, '4-'6 in. across, greenish-white, fragrant. Calyx-lobes subulate. Corolla-tube '3 in. long; lobes oblong. Anthers exserted. Stigma long, spindle-shaped. Berry globose, '3-'4 in. diam., 4-seeded,—whence the specific name.

JAUNSAR and TEHRI-GARHWAL, up to 5,000 feet: Tons Valley from Maindrot to Mautárgádh. Common at Korwá. Also OUTER HIMALAYA': Málköt.

Wood white, very hard and tough; weight 56 lbs. per c. ft.: straight branches can be made into walking-sticks.

Fl. Apl., May. Fr. Cold season.

2. R. uliginosa, DC.; Fl. Br. Ind. iii. 110; Brandis For. Flora 273, Ind. Trees 381; Gamble Man. Ind. Timb. 412. Vern. Pindálú, Pindár, Pindorá, Pendúá, Penáúrá, Hind.: Pandárá, Saháranpur.

A rigid small tree with reddish-brown bark and quadrangular branches. Leaves approximate at the ends of the branchlets. 2-8 by 1-4 in., obovate or obovate-oblong from a cuneate base, shining above, often pubescent along the nerves beneath, the upper usually subtending a few 5 in long sharp decussate weak spines. Flowers white, solitary, sessile or peduncled. Calyx-tube over 1 in. long; lobes rounded. Corolla large, 1-2 in. diam., showy; limb spreading; mouth of the tube partially closed with a ring of white hairs in the sessile flowers. Stigma fusiform, often 2-lobed. Fruit ovoid, up to 2 in. long, with a thick hard pulp.

Likely to occur in swampy grass lands in the Dún; common in wet lands in Lower Saháranpur as at Pathri.

Wood whitish-grey, close-grained and hard; weight 48 lbs. per c. ft. The fruit is eaten, and the leaves are browsed by deer and cattle.

New leaves April. Fl. May, June. Fr. Cold season.

3. R. dumetorum, Lamk.; Fl. Br. Ind. iii. 110; Brandis For. Flora 273, Ind. Trees 382; Gamble Man. Ind. Timb. 413. Vern. Maindal, Mainphal, Hind,

A large deciduous shrub or small tree with grey bark, and often long and stout axillary spines. Leaves 1-2 in. long, obovate, obtuse or acute, narrowed into the short marginate petiole, glabrous or pubescent or rough with stiff hairs; stipules ovate, acuminate. Flowers greenish- or yellowish-white, fragrant, solitary or 2-3 together at the ends of short lateral branchlets, shortly pedunculate. Calyx strigose; tube '2-'3 in. long; lobes ovate, foliaceous, as long as the tube. Corolla-lobes spreading, oval or oblong, '5-'75 in., covered with adpressed white hairs; tube up to the tips of the calyx-lobes. Fruit a soft fleshy berry, 1-1'5 in. long, globose or ovoid, yellow, glabrous or pubescent; pericarp thick, leathery; seeds compressed, imbedded in a gelatinous pulp.

Extremely common throughout the Siwalik Division, and also found in the Ámláwa and Tons Valleys in Jaunsar. Affects the shade of Sál and other forest trees.

Wood light-brown or white, compact, hard,—used for agricultural implements, walking sticks, fences and fuel. Weight 55-60 lbs. per c. ft. The leaves are lopped for fodder. The unripe fruit is used to poison fish, and is also eaten raw or roasted when ripe. The bark and the fruit are used in Indian medicine.

Fl. Apr.-June. Fr. Cold season.

6. Gardenia, Linn.; G. P. n. 167

1. G. turgida, Roxb.; Fl. Br. Ind. iii. 118; Brandis For. Flora 270, Ind. Trees 380; Gamble Man. Ind. Timb. 416. Vern. Thanelá, Hind.

A small deciduous tree, armed with strong axillary often leafbearing spines; bark smooth, bluish-grey, mealy on branches. Leaves opposite, crowded at the ends of the branches, very variable in size, 1-4 in. long, obovate or elliptic, obtuse or short-acuminate, coriaceous, tomentose beneath, pubescent or glabrous and at length shining above, sessile or narrowed into a short marginate petiole; stipules triangular, distinct, caducous. Flowers 1-4, about 1 in. long, fragrant, axillary or at the ends of short lateral branchlets. Calyx 15 in. long, sub-truncate in male flowers, with oblong foliaceous lobes in female flowers. Corolla white; tube '3-'5 in. long, slightly dilated upwards; lobes oblong, longer than the tube. Stamens as many as the corolla-lobes; anthers sessile, linear, included with only the tips slightly exserted. Ovary 1-celled; ovules numerous, inserted in 2 series on 2-6 parietal placentas. Fruit 2-3 in. long, pyriform, obovoid or globose, grey-mealy outside, furrowed at the base; pericarp thick, leathery; endocarp woody; seeds numerous, compressed, immersed in pulp.

Common throughout the Saháranpur Siwaliks, especially near Ranipur, Dholkhand and Sháhjahánpur. Also found in certain localites in the Dún, e.g., Lachiwála, Nágsidh, Timli, etc., but not quite so common.

Wood dirty-white, close-grained, fairly hard, weighing about 55 lbs. per c. ft. It splits and cracks in seasoning, and is scarcely used except for fuel. The fruit is eaten cooked in Central India, and is also used medicinally, especially in affections of the mammary glands,—whence the vernacular name.

According to Forest Ranger Pandit Nathu Singh, if one places one's hands on the stem of this tree in the summer so as to encircle it, the leaves begin to shake.

Fl. Mar., Apr. Fr. Cold season.

7. Pavetta, Linn.; G. P. n. 236.

1. **P. indica,** Linn.; Fl. Br. Ind. iii. 150; Brandis Ind. Trees 387; Gamble Man. Ind. Timb. 421. Syn.—*P. tomentosa*, Smith; Brandis For. Flora 275, Vern. *Angári*, Dún.

A large shrub with smooth brownish-grey bark. Leaves opposite, 3-9 by 1-3.5 in., elliptic obovate or oblanceolate, obtuse acute acuminate or caudate, subcoriaceous, glabrous or tomentose; lateral nerves 10-15; petiole '5-1.5 in. long; stipules united into an intrapetiolar sheath, generally persistent. Inflorescence a terminal or sub-lateral, dense or lax, flat-topped corymb. Flowers white, fragrant; bracts broad, membranous. Calyx about '08 in. long, shortly-toothed. Corolla about 1 in.; tube long, very slender; lobes 4, oblong, twisted in bud, afterwards spreading and recurved. Stamens 4, on the mouth of the corolla-tube; filaments short. Ovary 2-celled; ovule solitary, attached to a prominent placenta; style

filiform, twice as long as the corolla-tube; stigma slender, fusiform. Berry the size of a pea, with 2 plano-convex pyrenes; seeds peltate.

Var. tomentosa, Roxb., is characterised by having the inflorescence and leaves beneath pubescent or villous, and the corymbs sublateral (at the extremities of lateral often leafless branchlets) and long peduncled.

Common in moister parts of forest in the Dún and the SIWALIK TRACT: Tháno, Lachiwála, Mohkumpur, Rámgarh, Ásáröri, etc.

Wood light-brown, hard and close-grained; weight 59 lbs. per c. ft.

Fl. Apr., May. Fr. Cold season.

8. Coffea, Linn.; G. P. n. 238.

1. C. bengalensis, Roxb.; Fl. Br. Ind. iii. 153; Brandis For. Flora 277, Ind. Trees 390; Gamble Man. Ind. Timb. 422.

A small deciduous shrub with slender spreading branches, and thin brownish-grey bark. Leaves opposite, about 5 by 3 in., ovate or elliptic, acuminate, membranous, glabrous, narrowed into a short petiole; stipules interpetiolar, broad, subulate, persistent. Flowers solitary or in pairs, axillary, white, fragrant, 1-15 in. across, appearing before or with the leaves. Calyx-tube short, many-toothed. Corolla funnel-shaped; tube '5-'7 in. long; lobes ovate-oblong, slightly shorter than the tube, spreading or recurved, twisted in bud. Stamens inserted in the mouth of the corolla-tube; anthers subsessile, narrow. Ovary 2-celled; ovules solitary, peltately attached to the dissepiment; style bifd, filiform. Fruit a drupe, about '5 in. long, oblong, black, with 2 plano-convex pyrenes; seeds plano-convex, with a ventral groove; albumen horny.

Fairly common in shady ravines in the Dún, and along the foot of the Outer Himalaya: Bindál-nálá, Lachiwála, Rámgarh, Tháno, Nálápáni, Robbers' Cave, Mothropwála, etc.

The seeds are used as coffee in the Eastern Duárs of Bengal.

Fl. Mar., Apl. Fr. June, July.

The real Coffee shrub, C. arabica, Linn.; Fl. Br. Ind. iii. 153—is cultivated as an ornamental garden plant in the Dún. It is usually of a larger size than the above. Flowers numerous, in axillary fascicles. Fruit fleshy, purple when ripe.

9. Hamiltonia, Roxb.; G. P. n. 289.

1. **H. suaveolens**, Roxb.; Fl. Br. Ind. iii. 197; Brandis For. Flora 278, Ind. Trees 390; Gamble Man. Ind. Timb. 425. Vern. *Páderá*, Málköt; *Páderái*, Jaunsar.

A small shrub with divaricate branches. Leaves opposite, 6-9 by 2-4 in., elliptic oblong or ovate, acute or acuminate, glabrous or pubescent, coriaceous, tough; main lateral nerves 10-15 pairs, arcuate, very prominent beneath; base acute; petiole '5-1 in.; stipules intrapetiolar, short, acute, persistent. Flowers sessile or shortly pedicelled, bluish-purple, sweet-scented but give an unpleasant smell when bruised, club-shaped in bud; fascicled in large lax trichotomous panicles; fascicles subumbellate; bracts subulate. Calyx-segments 4-5, longer than the ovary, persistent. Corolla-tube '5 in. long, trumpet-shaped, pubescent; lobes valvate. Stamens and style more or less exserted according to sex. Capsules ellipsoid, '1-'15 in. long, 1-celled, 5-seeded; seeds triquetrous.

OUTER HIMALAYA, the DÚN and the SIWALIKS, also low hot valleys in JAUNSAR; fairly common; a prevalent gregarious weed about Paléd, Málköt and such other places.

The wood is used for making gun-powder charcaol in Chamba. Fl. Oct.-Jan.

10. Leptodermis, Wall.; G. P. n. 290.

1. **L. lanceolata**, Wall.; Fl. Br. Ind. iii. 198; Brandis For. Flora 279, Ind. Trees 391; Gamble Man. Ind. Timb. 426. Vern. *Páderá*, Jaunsar; *Páderá* or *Jogiá Páderá*, Garhwal and Kumaon.

A small shrub, generally gregarious on rocks; bark thin, grey. Leaves opposite or whorled, very variable, '5-4 by '15-1'5 in.; ovate elliptic or elliptic-lanceolate, fetid when bruised; petiole '1-3 in. long. Flowers '5-7 in. long, white but fading to pale-yellow, 4-6-merous, in bracteate heads which are disposed in large terminal panicles; bracteoles cuspidate, connate to form an involucre. Calyx-tube obconic; lobes 5, valvate, persistent. Corolla funnel-shaped, hairy within; lobes 5, valvate. Stamens 5, exserted in the male flowers. Ovary 5-celled; ovule 1 in each cell; style filiform, with 5 linear arms, exserted in the female flowers. Capsules 5-valved, each valve terminating in a persistent ciliate calyx-tooth; seeds with a membranous testa.

OUTER HIMALAYA and JAUNSAR, 3,-9.000 ft.: Sahansra dhárá, Mussoorie; Konáin, etc. Wood hard, close-grained, white. Fl. July-Sept. Fr. Nov.-Jan.

Order 2.-ASTERALES.

FAM. 46. COMPOSITÆ; G. P. N. 88.

Herbs or shrubs, rarely trees. Leaves exstipulate, alternate or opposite, simple or compound. Inflorescence a bracteate head. Flowers numerous, small, sessile, all tubular, or the outer or all ligulate; all bisexual, or the inner male and the outer female or neuter, sometimes diœcious. Calyx superior; limb none, or of hairs or scales. Corolla either tubular or campanulate with 4-5 valvate lobes, or ligulate with strap-shaped elongated connate lobes. Disk epigynous. Stamens 4-5, usually syngenesious, anthers basifixed; connective produced. Ovary inferior, 1-celled; ovule solitary, erect; style slender, 2-fid, arms linear, often hairy. Fruit a cypsela usually crowned with the hairy calyx (pappus); seed exalbuminous; testa membranous.

With very few exceptions, all the species in this largest of all Families are herbaceous, *Leucomeris*, described below, being the only tree Genus found within our limits.

1. Leucomeris, Don; G. P. n. 674.

1. L. spectabilis, Don; Fl. Br. Ind. iii. 386; Brandis Ind. Trees 400; Gamble Man. Ind. Timb. 428. Vern. Phúsiári, Phúsiára, Hind.

A large shrub or small tree with white corky bark; branches stout, grooved. Leaves alternate, 4-14 by 1.5-4 in., narrow-oblong or oblanceolate, entire or minutely cuspidate-serrate, coriaceous, glabrous above, thickly white-felted beneath, narrowed into a marginate

petiole '5-1 in. long: lateral nerves about 16 pairs. Heads. '7-1 in. long, in globose thickly white-tomentose bracteolate corymbs. Flowers 4-8 in each head, all similar and fertile, about 1 in. long: bracts in many series. Involuce much shorter than the flowers. Corolla 5 in. long, tubular; segments narrow. Style 2-fid. Cupsela about 2 in. long, 5-ribbed, slender, densely silky; pappus 5 in. long. rather rigid.

Fairly common in the OUTER HIMALAYA from Sáiá to Rikhikesh, 3.-6.000 ft. Occasionally in the Dún, e.g., at Buláwála and Káluwála.

The wood is brownish-white, fairly compact and even-grained. but the tree is generally hollow in the centre, rendering the wood uscless.

Fl. Cold season. Fr. Apr., May,

The following plants deserve notice:

- 1. Vernonia Roxburghii, Less. : Fl. Br. Ind. iii. 232 : Brandis Ind. Trees 399. An undershrub common in blanks and grass lands near Lachiwals and elsewhere in the Don. Leaves alternate, subsessile or shortly petiolate, scabrid, cuspidate-serrate. Heads. 30flowered, sessile, in terminal corymbs, Cupsela hairy; pappus whitish.—G, P. n. 16.
- 2. Inula Cappa, DC.; Fl. Br. Ind. iii. 295; Brandis Ind. Trees An undershrub common in the OUTER HIMALAYA. Branches. inflorescence and under-side of leaves silky-tomentose. Leaves alternate, oblong-lanceolate, shortly petiolate, distantly toothed, hairy or scabrid above. Heads small, very numerous, heterogamous. Cypsela '05 in.; pappus '15 in., dirty yellowish-white; hairs thickened at the end.—G. P. n. 275.
- 3. Inula cuspidata, Clarke; Fl. Br. Ind. iii. 296; Brandis Ind. Trees 401. A glabrous undershrub with slender branches. Leaves 3-5 in., elliptic-lanceolate, serrulate, acuminate, pubescent when young. Heads numerous, in terminal corvmbs. Cupsela silky. '06 in.; pappus yellowish, hairs thickened at the tip. JAUNSAR and OUTER HIMALAYA, up to 6,000 ft.
- 4. Siegesbeckia orientalis, Linn. : Fl. Br. Ind. iii. 304 : Duthie Fl. Up. Gang. Pl. 467. Vern. Lichkurá, Garhwal. A large erect annual up to 6 or 7 ft. in height, common on damp fallow lands and coppice areas throughout the SIWALIK DIVISION and the HILLS up to 5,000 ft., conspicuous by the large spreading linear-spathulate outer

involuerate bracts which by means of their viscous glandular hairs eatch on to clothes. Leaves opposite, 2-5 by 1-3·5 in., gradually smaller upwards, triangular-ovate, irregularly toothed, velvety-pubescent, gradually narrowing into a winged petiole. Heads small, peduncled, one at each node of the branches or branchlets. Flowers usually yellow. Cypsela curved, quadrangular, black, each enclosed in an inner bract. The leaves, which are very bitter, are used by the hill-people as a febrifuge, each being pounded and kneaded into a pill to be taken with a little water. Fl. Oct.-Dec.—G. P. n. 361.

- 5. Artemisia vulgaris, Linn.; Fl. Br. Ind. iii. 325; Brandis Ind. Trees 402. Vern. Sámri, Dún. A gregarious weed in gardens and camping grounds in the Dún, and sunny slopes in the HILLS, aromatic and shrub-like. Leaves large, ovate, lobed or laciniate, tomentose beneath. Heads 15-2 in., in large panicled racemes.—G. P. n. 551.
- 6. Echinops echinatus, DC.; Fl. Br. Ind. iii. 358. Vern. Gokhrú, Hind. A thistle-like herb with white felt, common in fallow lands in the Dύn. Leaves alternate, pinnatifid, spinous, thickly white-felted beneath. Heads 1-flowered, crowded in a globose white ball 2-3 in. across. Cypsela obconic, silky.—G. P. n. 621.
- 7. Catamixis baccharoides, Thoms.; Fl. Br. Ind. iii. 389. An undershrub 3-5 ft. high, found in sandy cliffs in the SIWALIK-TRACT, e. g., Timli Pass, Beribárá, etc. Leaves alternate, 2-3 by 1-1-5 in., obovate, distantly crenate above the middle, coriaceous; petiole very short, half-amplexicaul. Heads yellow, small, in broad terminal corymbs. Corolla 2 in. long, ligulate. Cypsela turbinate, silky-villous; pappus 3 in. long, white. Fl. Dec., Jan.—G. P. n. 638.
- 8. Gerbera lanuginosa, Benth.; Fl. Br. Ind. iii. 390. Vern. Küpherü. Jaunsar; Jhülä, Jhülü, Kapās, Garh. Jaunsar and Tehri-Garhwal up to 8,000 ft., also in shady places along the crest of the Siwaliks, almost always on cliffs. A scape-bearing small herb with lyrately pinnatifid or lobed radical leaves thickly felted below. Scape 4-12 in. long. cottony. Heads 1.1.5 in. across, hemispherical. Cypsela ribbed. The cotton obtained from the leaves is used by the Jaunsaris as tinder for their chuckmuck, and occasionally made into coarse cloth or bags.—G. P. n. 695.

Series ii.—Hypogynæ.

Order 3.—ERICALES.

FAM. 47. ERICACEÆ; G. P. N. 93.

Shrubs or trees, rarely herbs. Leaves usually alternate, simple, exstipulate. Flowers solitary fascicled or racemed, usually regular, sometimes dimorphous. Calyx usually free; lobes 5, rarely 4 or 6. Corolla hypogynous, campanulate or urceolate. Stamens generally twice as many as the corolla-lobes, hypogynous or epipetalous; filaments free; anthers 2-celled, opening at the top by pores or slits, rarely longitudinally. Ovary superior, 4-5-many-celled; ovules many in the inner angles of the cells; style cylindrical; stigma entire or obscurely lobed. Fruit a 5-valved capsule; seeds very small, albuminous.

Analysis of the Genera.

Flowers in racemes; capsules globose, loculicidally dehiscent . . . 1. Pieris.

Flowers fascicled or subcorymbose; capsules elongate, septicidally dehiscent . 2. Rhododendron.

1. Pieris, D. Don.; G. P. n. 17.

1. **P. ovalifolia**, D. Don; Fl. Br. Ind. iii. 460; Gamble Man. Ind. Timb. 431; Brandis Ind. Trees 409. Syn. Andromeda ovalifolia Wall.; Brandis For. Flora 280. Vern. Âyâr, Ânyâr, Jaunsar.

A small deciduous tree; bark brown, peeling off in narrow strips, often deeply furrowed with spiral clefts. Leaves 3-6 in. long, ovate or elliptic-oblong, acute or acuminate, entire, rounded at the base, coriaceous, glabrous, often pilose beneath when young; petiole 2-5 in. Inflorescence a simple raceme, rarely falsely panicled; bracts lanceolate or linear, deciduous. Flowers white. Calyx-lobes 5, triangular-lanceolate, '10-'12 in., connate at the base. Corolla '2-'4 in. long, elongate-ovoid, pubescent without; lobes 5, short, recurved. Stamens 10, hypogynous; filaments subulate, ciliate, with two filiform appendages at the apex; anthers open by terminal pores. Ovary 5-celled, ovules many in each cell. Capsules '2 in. diam., globose, loculicidally 5-valved; seeds many, minute, linear-oblong.

Common in Jaunsar, between 4,000 and 8,000 ft., always associated with Quercus incana and Rhododendron arboreum.

Wood light, reddish-brown, moderately compact and hard, but not durable and warps and shrinks badly in seasoning; weight 41 lbs. per c. ft. It is used only for fuel and charcoal, but even as fuel it is not considered good, as it does not burn well but only smoulders. The leaves are poisonous to goats and camels; they are used to kill insects, and an infusion of them is applied in skin diseases of parasitic origin.

Fl. Apr.-June according to elevation. Fr. July-Sept.

2. Rhododendron, Linn.; G. P. n. 46.

Trees or shrubs. Leaves alternate or falsely whorled, often clustered at the ends of the branches, entire, coriaceous, edges often slightly recurved. Flowers usually in compact terminal clusters or in umbelliform corymbs, rarely solitary; buds enclosed in scaly bracts. Calyx 5-lobed, sometimes obsolete. Corolla campanulate or funnel-shaped; lobes 5-10. Stamens usually 10, rarely 5 or 20; anthers dehiscing by terminal pores. Ovary 5-20-celled; ovules many in each cell. Capsules septicidally 4-20-valved from the apex; seeds very numerous, scale-like, albuminous.

Analysis of the Species.

Trees or large shrubs; calyx small or obsolete (flowers in terminal corymbs).

Leaves silvery or rusty-tomentose beneath; pedicels 0 or very short; ovary woolly.

Leaves cinnamonous-tomentose beneath; pedicels long; ovary glabrate

Small shrubs; calyx prominently lobed, lobes long, foliaceous.

Flowers solitary or 2-3 together; peduncles long, scabrous; leaves subsessile

Flowers in terminal corymbs; pedicels short, glabrous; leaves petiolate .

1. R. arboreum.

2. R. campanulatum.

3. R. lepidotum.

4. R. Anthopogon.

1. **R. arboreum,** Sm.; Fl. Br. Ind. iii. 465; Brandis For. Flora 281, Ind. Trees 409; Gamble Man. Ind. Timb. 433. The Tree-Rhododendron. Vern. Búráns. Jaunsar.

A small evergreen tree; bark reddish-brown, peeling off in small flakes. Leaves crowded at the ends of the branches, 4-6 in. long, lanceolate or elliptic-oblong, acute at both ends, coriaceous, glabrous above, rusty-tomentose or covered with small silvery scales beneath; nerves and midrib prominent beneath, depressed above; buds viscous. Flowers large, very showy, commonly deepcrimson, rarely pink or nearly white, in corymbose fascicles at the ends of the branches; pedicels 0 to one-third the length of the worolla-tube; bracts hairy. Calyx-lobes 1 in. wide, ovate, or very obscure. Corolla campanulate, 1-1 5 by 8-1 in.; lobes 5, often unequal. Stamens 10, alternately longer. Ovary woolly, 7-9-celled. Capsules 1 in. long, cylindrical, curved, longitudinally ribbed; seeds ellipsoid.

Common in Jaunsar and Tehri-Garhwal, between 4,000 and 8,000 ft., almost always associated with *Pieris ovalifolia* and *Quercus incana*.

Wood soft, brownish or reddish-white, close-and even-grained, seasons badly, and is apt to warp and shrink; weight 40-45 lbs. per c. ft. It is chiefly used for fuel and charcoal, but is sometimes locally used for building, for making dishes, gun-stocks, tool-handles, etc. The flowers which are sour to the taste are eaten and are made into preserves. They are believed to be good for dysentery and are applied as a poultice in headaches, also offered in temples a the hills. The viscid tender leaves are eaten cooked as a regetable.

Fl. Usually Mar.-May. Fr. Autumn and cold season.

2. R. campanulatum, Don; Fl. Br. Ind. iii. 466; Brandis For. Flora 281. Ind. Trees 410; Gamble Man. Ind. Timb. 434. Vern. Simris, T.-Garhwal.

A moderate-sized evergreen shrub with thin grey bark. Leaves 3.5 in. long, elliptic or elliptic-oblong, rounded at both ends, crowded at the ends of the branches, mucronate, coriaceous, glabrous and finely reticulate above, with a dense cinnamon-colour tomentum concealing the nerves beneath; midrib prominent. Flowers large and showy, whitish-pink purple or lilac, in lax terminal corymbs; pedicels as long as the corolla-tube; bracts silky. Calyx-teeth broadly triangular, very small. Corolla campanulate, 1-1.5 by 8-1 in.; lobes 5. Stamens 10. Ovary 5-9-celled, glabrous; style persistent. Capsules cylindrical. about 1 in. long, more or less curved; seeds linear-oblong, compressed.

Тены-Garhwal, above 10,000 ft.: Rikhshin, Kedár Kántá Chánsil, etc.

Wood light pinkish-red, close-grained and moderately hard; weight about 40 lbs. per c. ft. "The leaves are brought to the plains and used as snuff."—Sir D. Brandis.

Fl. May-July. Fr. Oct.-Dec.

3. R. lepidotum, Wall.; Fl. Br. Ind. iii. 471; Brandis For. Flora 282, Ind. Trees 412; Gamble Man. Ind. Timb. 432. Vern. Simris, T.-Garhwal.

A small aromatic shrub; young parts covered with glandular scales. Leaves '7-1 in. long, approximate at the ends of the branches, seesile or subsessile, obovate and obtuse, or lanceolate and subacute, glabrous above, silvery- or brown-tomentose beneath. Flowers red yellow or purple, solitary or 2-3 together; pedicels '5-1'5 in. long, very scabrous. Calyx-lobes oval; not ciliate. Corolla-tube short; lobes round, spreading, '2-'3 in. long. Stamens usually 8. Ovary 5-celled. Capsules 5-celled, '3 by '2 in.; seeds oblong, acute.

Tehel-Garhwal, 9,-11,000 ft., usually on rocks.: Chánsil, Gangottari, etc.

"The leaves of this and the preceding species are used as stimulants in native medicine" (Sir D. Brandis) under the name Tálisfar (?) or Tálispát.

Fl. June, July.

4. **R. Anthopogon,** Don; Fl. Br. Ind. iii. 472; Brandis For. Flora 282, Ind. Trees 412; Gamble Man. Ind. Timb. 432. Vern. *Tálisi*, *Tálisri*, Punjab Hills.

A small shrub with an aromatic odour; branchlets scabrous and scaly. Leaves 1-1.5 in. long, elliptic or broad-oblong, shining above, brown-tomentose beneath; petiole '12-'25 in. long. Flowers yellow, in dense terminal corymbs. Calyx-lobes oblong or elliptic, membranous, ciliate. Corolla tubular with a dilated mouth; tube '2 in. long; lobes oblovate, entire, spreading. Stamens 6-8. Ovary scaly. Capsules '2 in. long, ovoid; seeds oblong, subacute.

Tehei-Garhwal, above 11,000 ft.: Kedár Kánta, Harki Dún, etc. Also the Chur Mountain, Jubbal. Gregarious and generally under the equally gregarious Betula utilis.

Fl. June, July.

Order 4.—PRIMULALES.

FAM. 48. MYRSINACEÆ; G. P. N. 100.

Shrubs or small trees. Leaves alternate, simple, exstipulate, generally gland-dotted. Flowers small, regular, in axillary clusters racemes or panicles, rarely terminal. Calyx free, exceptionally adhering to the ovary; lobes persistent, sometimes accrescent in fruit. Corolla regular; petals connate or free, contorted or imbricate. Stamens epipetalous, as many as the petals or corolla-lobes and opposite to them; anthers oblong, free or united by their margins. Ovary 1-celled; ovules few or many, inserted on a free-central placenta; style filiform or columnar. Fruit a berry, often coloured; seeds excavate at the base.

Analysis of the Genera.

Calyx adnate to the ovary; fruit many-seeded .	1.	MÆSA.
Calyx free; fruit 1-seeded.		
Petals free; flowers racemed or panicled	3.	EMBELIA.
Petals united into a short tube.		
Fls. in dense axillary clusters; corolla imbricate.	2.	MYRSINE.
Fls. in umbels racemes or corymbs; corolla		
twisted to the right	4.	Ardisia.

1. Mæsa, Forsk.; G. P. n. 1.

1. **M. indica**, Wall.; Fl. Br. Ind. iii. 509; Brandis For. Flora 283, Ind. Trees 414; Gamble Man. Ind. Timb. 438.

A large shrub with long straggling branches. Leaves 3-5 by 1-1.5 in., lanceolate or elliptic-oblong, distantly sharp-toothed, subcoriaceous or membranous; primary nerves 5-9 pairs; petiole about 5 in. Flowers white, small, in compound racemes; bracts minute. Calyx-tube more or less adnate to the ovary; lobes 5, obtuse, pubescent, persistent. Corolla gamopetalous, white, 5-lobed, twice the size of the calyx. Stamens 5; filaments short; anthers broad. Fruit a globose berry, about 15 in. across, crowned with the persistent calyx-lobes and often tipped by the remains of the style, fieshy juicy and pinkish-white when ripe.

Common in the Sub-Himalayan Hills: Paléd, Sansárú Khálá, Mussoorie, etc.

The berries are eaten in Nepal, and the leaves are used to poison fish in Canara.

Fl. Dec,-Apr. and sometimes also in the rains. Fr. Cold season.

2. Myrsine, Linn.; G. P. n. 2.

Shrubs or small trees. Leaves entire or serrate, punctate, usually coriaceous. Flowers polygamous or diocious, fascicled usually at the axils of fallen leaves; bracts densely imbricate. Calyx 4-5-lobed, persistent. Corolla 4-5-partite; segments imbricate, recurved. Stamens 4-5. Ovary superior, globose; ovules many; style short, cylindrical. Fruit a 1-seeded small globose berry, red or purple when ripe, seed excavate.

Analysis of the Species.

1. M. africana, Linn.; Fl. Br. Ind. iii. 511; Brandis For. Flora 286, Ind. Trees 416; Gamble Man. Ind. Timb. 438. Vern. Banwán, Jaunsar; Rikhdálmi, Garhwal.

A small evergreen shrub; branchlets and petioles ferruginous-pubescent. Leaves '5-1'5 by '3-'5 in., lanceolate or obovate, sharply cuspidate-serrate; midrib prominent; petiole minute. Flowers small, subsessile, tetrandrous, in a villary fascicles of 4-6. Anthers exceeding the corolla. Style short; stigma flat. Berry usually solitary, red, smooth, '1 in. diam., swelling to '25 in. diam. and dark-purple or black when fully ripe.

Common in Jaunsar and in the Outer Himalaya, 3,-9,000 ft.

The fruit is used in Indian medicine as an anthelmintic under the name of Bebrang.

Fl. Mar.-May. Fr. Apr.-May to Nov.-Dec.

2. M. semiserrata, Wall.; Fl. Br. Ind. iii. 511. Brandis For. Flora 285, Ind. Trees 416; Gamble Man. Ind. Timb. 439. Vern. Bains, Gaunta, Garhwal.

A shrub or small tree with ash-coloured bark. Leaves 2-5 by '5-1'2 in., lanceolate, acute, entire or sparingly cupsidate-serrate towards the apex, coriaceous, gland-dotted, glabrous; petiole'1-'3 in. long. Flowers '1 in. diam., in dense axillary fascicles; pedicels '2-'3 in. long, glabrous. Calyx persistent, half the length of the corolla-lobes. Style short. Berry the size of a small pea, generally clustered, globose, red, shining; seed solitary, globose.

OUTER HIMALAYAN RANGES and valleys in JAUNSAR and TEHRI-GARHWAL up to 6,000 ft.: Sansárú Khálá, Mussoorie; Korwá Chakrata, Dhárágádh, etc.

Wood compact, heavy, hard and handsome, and said to be esteemed in Nepal for carpenter's work; weight 50 lbs. per c. ft.

Fl. and fr. Cold season.

3. Embelia, Burm.; G. P. n. 8 (Samara).

1. **E. robusta**, Roxb.; Fl. Br. Ind. iii. 515; Brandis For. Flora 284, Ind. Trees 416; Gamble Man. Ind. Timb. 440. Vern. Gáiá, Dún.

A large scrambling shrub; bark brown, with horizontal cracks and numerous lenticels on the branches. Leaves 5.7 by 2.3 in., obovate-oblong elliptic or oblanceolate, short-acuminate, undulate, sometimes obscurely serrulate, usually rusty-pubescent beneath; lateral nerves 6-12 pairs, prominent, arcuate; base cuneate; petiole

glandular, usually channelled. Flowers small, mostly diccious, in axillary and terminal simple or fascicled racemes. Calyx free, deeply 5-lobed, persistent. Petals 5, oblong, reflexed, puberulous. Stamens 5, adnate to the petals. Ovary superior, globose; ovulés few, embedded in a fleshy placenta; style short, persistent. Fruit a dry berry, globose, red, more or less longitudinally ripbed, crowned with the remains of the style; seed usually solitary, globose, with a hollowed base.

Common in the Dún and Saháranpur Forests: Lachiwála, Pardúni, Dharmáwála, Mohkumpur; Kasúmri, etc.

The fruit has the same vernacular name and economic use as those of Myrsine africana.

FL July-Sept. Fr. Cold season.

4. Ardisia, Swartz.; G. P. n. 12.

 A. humilis, Vahl; Fl. Br. Ind. iii. 529; Brandis For. Flora 287, Ind. Trees 418; Gamble Man. Ind. Timb. 441.

A large glabrous shrub. Leaves 4-8 by 1.5-3.5 in., obovate-oblong or elliptic, acute or short-acuminate, entire, coriaceous, fleshy; lateral nerves not very conspicuous; base cuneate; petiole marginate. Flowers 2-sexual, rose-coloured or pinkish-white, about 5 in. across, in axillary corymbose racemes; pedicels 1-2 in. long in the fruit, somewhat shorter in flower; bracts deciduous. Calyx-lobes 5, obtuse, oval or rounded, slightly enlarged in fruit. Corolla deeply 5-lobed; segments acute, twisted to the right in bud. Stamens 5; filaments short; anthers acute. Ovary free, 1-celled, tapering; style long, persistent. Fruit globose, the size of a large pea, black when fully ripe, full of a pink juice.

Fairly common in the damper parts of the Dún Forests, especially along shady ravines.

Wood soft, used only for fuel.

Fl. in all seas ms, but chiefly Mar., Apr. Fr. generally cold season.

Order 5.—EBE NALES.

FAM. 49. SAPOTACEÆ; G. P. N. 101.

Trees or shrubs, often with milky juice. Leaves alternate, simple, entire, coriaceous, generally exstipu-

late. Flowers bisexual, axillary, solitary or elustered; bracts minute or none. Calyx-lobes 4-8 and imbricate, or multiseriate with the outer series valvate. Corollatube short; lobes as many, or 2-4 times as many, as the calyx-lobes. Stamens upon the corolla-tube, as many as the corolla-lobes or as the lobes of the inner series and opposite to them, or numerous in 1-3 series, sometimes alternating with staminodes; filaments short; connective, often produced. Ovary superior, 2-8-celled, with a solitary anatropous ovule in each cell. Fruit a berry. Seeds 1-8, ellipsoid, often compressed, exalbuminous and with flat cotyledons; testa usually crustaceous.

1. Bassia, Linn.; G. P. n. 14.

Trees with milky juice. Leaves stipulate; stipules caducous. Flowers on axillary, generally fasciculate, pedicels. Calyx deeply 4-8-lobed; lobes biseriate, the outer lobes valvate, the inner sub-imbricate, in bud. Corolla-tube ovoid or campanulate; lobes 5-14, contorted in bud. Stamens at least twice as many as the corolla-lobes, all fertile; anthers cordate, acute, with a mucronate connective. Ovary villous, usually 6-8-ceiled; style long-exserted, persistent. Fruit an oblong or globose berry, 1-3-seeded, exalbuminous; cotyledons fleshy, oily.

Analysis of the Species.

 B. latifolia, Roxb.; Fl. Br. Ind. iii. 544; Brandis For.
 Flora 289, Ind. Trees 426; Gamble Man. Ind. Timb. 447. Vern.
 Mauwá, Mahuá or Mohwá, Hind.

A large deciduous tree; young parts pubescent; bark grey or blackish, with shallow wrinkles and vertical cracks. Leaves clustered at the ends of the branches, 5-7 by 3-4 in., elliptic or oblong-elliptic, short-acuminate or obtuse, coriaceous, densely woolly beneath when young, glabrescent afterwards; main lateral nerves 10-12 pairs; base cuneate; petiole 1-1.5 in.; stipules subulate. Flowers numerous at the ends of the branches, on drooping woolly pedicels 1-1.5 in. long. Calyx coriaceous, densely rusty-tomentose; lobes 4, rarely 5. Corolla 6-8 in. long, fleshy and juicy, cream-coloured, early caducous; tube ovoid; lobes 7-14, usually 8-9, short, erect. Stamens generally 24-26; anthers hairy at the back, subsessile, inserted in 3 series inside the corolla-tube. Berry ovoid, fleshy, green, 1-2 in. long, 1-4-seeded.

Not very common in the area covered by this Flora. Occurs sporadically at Kálsi in Jaunsar, at Dúdhli, Phándowála and Sáinköt in the Dún, and about Beribára in the Saháranpur District.

Heartwood scanty, reddish-brown, very hard, close- and evengrained, tough and durable, and seasons well; weight about 65 lbs. per c. ft. But the tree is so much prized for its flower and fruit that it is rarely felled. The flowers are eaten raw or cooked, or made into sweetmeats. A coarse and strong spirit is also distilled from them. The fruit is eaten and gives, when expressed, a thick oil which is eaten, burned in chirághs, and is also used to adulterate ghee. The oil-cake is used to poison fish.

Leafless Feb.-Apr. Fl. Mar., Apr. Fr. June, July.

2. **B. butyracea**, Roxb.; Fl. Br. Ind. iii. 546; Brandis For. Flora 290, Ind. Trees 427; Gamble Man. Ind. Timb. 448. Vern. Chiura, Dún; Phalwárá, Phulel, Phuloá, Hind.

A large deciduous tree with dark-grey bark. Leaves 6-12 by 4-7 in., obovate or obovate-oblong, coriaceous, soft-tomentose beneath, crowded near the ends of the branches; lateral nerves 15-20 pairs; base rhomboid; petiole 1-1-5 in. long; stipules minute, caducous. Flowers on drooping tomentose pedicels 1-1-3 in. long, crowded below the terminal leaves in the axils of the lower ones. Calyx coriaceous, rusty-tomentose, deeply 5-cleft: lobes '3-5 in. long. Corolla pale-yellow; tube '7 in. long, cylindrical, not fleshy; lobes 8-10, spreading. Stamens 30-40; anthers exserted, not hairy. Berry ovoid, smooth, 1 in. long, 1-3-seeded.

It has only been found at Tapoban in the EASTERN Dun, and may possibly be found in the inner hills of Tehri-Garhwal.

The tree is valued for its fruit, from the seeds of which a vegetable butter is extracted. It makes good soap, and made into candles is said to burn without smoke or unpleasant smell. It is used as an external application for headache and for rheumatism. The oil-cake, as also the pulp of the fruit, is eaten. The sweet juice of fresh corolla is expressed and boiled into $g\acute{u}r$ which is much prized in Kumaon.

Fl. Nov.-Jan. Fr. June, July.

To this Family belong the following which are cultivated in gardens in Saharanpur and the Din:

Mimusops Elengi, Linn.; Fl. Br. Ind. iii. 548. Vern. Maulsári, Hind.,—the fragrant flowers of which are used in Indian perfumery.—G. P. n. 22.

Also Minusops hexandra, Roxb.; Fl. Br. Ind. iii. 549, Vern. Khirni, Hind.—noted for its edible fruit and useful timber.

FAM. 50. EBENACEÆ; G. P. N. 102.

Trees or shrubs. Leaves alternate, entire, exstipulate. Flowers axillary, regular, usually diœcious, generally bracteate, solitary or in small cymes. Calyx inferior, gamosepalous, often accrescent in fruit. Corolla gamopetalous. Stamens as many, or 2-3 times as many, as the corolla-lobes, free or variously united, absent or rudimentary in the female flowers; anthers linear, erect, introrse, with the connective usually prolonged beyond them. Ovary superior, 2 or more-celled, with usually one pendulous ovule in each cell; styles 2-8, distinct or connate at the base. Fruit an indehiscent, coriaceous or fleshy berry; seeds few, pendulous, albuminous; cotyledons foliaceous.

1. Diospyros, Linn.; G. P. n. 4.

Trees, rarely shrubs. Leaves alternate, sometimes subopposite, entire. Flowers directious, rarely polygamous the female often solitary. Calyx lobed; lobes often accrescent in fruit. Corolla tubular or urceolate, deeply lobed; lobes twisted to the right. MALE FLOWERS: Stamens 4-16 or more; ovary rudimentary. Female FLOWERS: Staminodes 0-16. Ovary usually 4-5-celled; ovules solitary in each cell. Fruit generally pulpy, 1-10seeded. Seeds usually compressed; albumen uniform or ruminated.

Analysis of the Species.

Leaves always alternate, oblong.

Leaves glabrescent ; fruit glabrous.

Leaves light-green, usually membranous and cordate.

Leaves dark-green, coriaceous when

mature, never cordate .

Leaves quite glabrous; fruit densely rusty Leaves alternate or subopposite, broad-ovate 4. D. tomentosa.

1. D. corditolia.

2. D. Kanjilali.

3. D. Embryopteris.

. D. cordifolia, Roxb. Cor. Pl. i 38, t. 50.—Syn. D. montana, Roxb.; Fl. Br. Ind. iii. 555; Brandis For. Flora 296, Ind. Trees 431; Gamble Man. Ind. Timb. 454. Vern. Bis Tendú. Hind.; Chambér, Saháranpur.

A large shrub with a short trunk and a broad rounded dense crown, often spinescent. Bark thin smooth pinkish or bluish-grey on branches, dark-grey or almost black and deeply cracked on old stems. Leaves 2-4 by 1-1.5 in., ovate or oblong, soft, membranous or subcoriaceous, light-green, pubescent or glabrescent; nerves slender; base cordate rounded or cuneate; petiole '2 in. or less. MALE FLOWERS in bracteate 3-flowered cymes. Calyx 4-cleft; lobes ovate. Corolla urceolate, with 4 short lobes. Stamens 16, in two series, glabrous; anthers not awned. Female flowers solitary, nodding, larger than the male flowers; pedicels with a pair of bracts at the apex. Calya deeply 4-fid; lobes ovate. Staminodes 4-12 in one series. Ovary glabrous, 8-celled, 1 ovule in each cell. Fruit globose, '5-1'2 in. diam., yellow when ripe, supported by the accrescent cathery calyx. Seeds compressed; albumen uniform.

Common in the lower Saharanpur Forests and also found occasionally in the Dún, e.g., Tháno, Lachiwála, etc.

The wood is hard and durable and is variegated with black and white streaks. It would perhaps be good for furniture, but at present there is no demand except for fuel. Heartwood not distinct, weight about 45 lbs. per c. ft. Every part of the tree, including the fruit, is bitter and has an unpleasant smell.

Fl. Mar.-May. Fr. Cold season.

Following the Flora of British India this tree was described as *D. montana* in the first edition of this book, but Roxburgh's distinction appears to be well founded and I have followed Col. Beddome and Mr. Duthie (*Ind. Forester XXXI*, 308) in keeping *D. cordijolia* distinct.

2. **D. Kanjilali**, Duthie in *Ind. For.* XXXI, 307; Brandis Ind. Trees 432, 713. Vern, *Pinná*, Málköt.

A small or middle-sized tree with a fairly long trunk and greenish or ashy-grey smooth bark; branches forming a narrow and open crown, not spinescent. Leaves 1.5-5.5 by 1-2 in., generally elliptic or oblong, dark-green, densely velvety-tomentose when young. almost glabrous and rigidly coriaceous when mature; midrib impressed above but prominent beneath, lateral nerves faint, arcuate: petiole 15-4 in. long. MALE FLOWERS in short 3-flowered axillary cymes; pedicels '06 in. long; bracts ovate, subacute, ciliate on the margins. Calyx-lobes broad and rounded, pubescent on both sides and with ciliate margins. Corolla 2-3 in. long, pale green, slightly pubescent outside, glabrous within. Stamens 16, in opposite pairs, united at the base; anthers awned, glabrous. Female flowers solitary, axillary, nodding, dark-green; pedicels 1-2 in. long. Calyx accrescent in fruit; lobes spreading, broader than in the preceding species. Corolla 2 in. long, urceolate, dark-green. Staminodes 8, alternately longer, the longer ones often toothed at the apex, the shorter obtuse. Fruit up to 1 in. diam., subglobose. Seeds generally 8 in each fruit, about 5 in. long, compressed, somewhat curved; albumen uniform.

Although not abundant, fairly common in certain localities, e.g., below Saia and the Jumna Valley in JAUNSAB; Kalsi, Rajpur and Malkot in the OUTER HILLS; Lachiwala and Thano in the Dun; and Ranipur, Dholkhand, Mohand and Badshahibagh along the foot of the SIWALLES.

Wood brownish-grey with occasional iron-grey streaks, fineand close-grained, moderately hard; no distinct heartwood; weight 50 lbs. Used for agricultural implements in Málköt.

Fl. Apr., May. Fr. Cold season.

3. D. Embryopteris, Pers.; Fl. Br. Ind. iii. 556; Brandis For. Flora 298, Ind. Tree: 434; Gamble Man. Ind. Timb. 455. Vern. Gáb, Kálá Tendú, Hind.

A middle-sized evergreen tree, with dark-green shining foliage, and dark-grey or greeni-h-black bark. Leaves distichous, 5-8 by 15-2 in., oblong, surfacute. coriaceous, smooth, shining; base obtuse; petiole wrinkled, 5 in., long. Flowers tetramerous, scented, white or cream-coloured. Malle Flowers in short pedunculate cymes of 3-6 flowers. Stamens many, hairy. Female Flowers 1-5 together, subsessile, larger than the male flowers. Staminodes up to 12. Ovary 8-celled; styles 4, lobed at the tips. Fluit subglobose, 1-5-2 in. diam., glandular or rusty, supported on the much-accres ent calyx, yellow when ripe. Seeds 5-8, compressed, embedded in a glutinous pulp, often rudimentary under cultivation.

Found in the D¢n in moist shady localities, e.g., Khairi Forest, Jogiwála, Ámbári, Báronwála, etc. Also in ravines in the Kálsi Forest. Cultivated in Dehra.

Wood white, moderately hard and close-grained, used for building. Heartwood not distinct, weight 52 lbs. per c. ft. Round the seeds of the ripe fruit, filling the cells, is a honey-like sweet substance which is eaten. The same substance in the unripe fruit is used as gum in book-binding, and in place of tar for paying the seams of country boats. An infusion of the pulp of unripe fruit is used to render fishing nets and lines durable. The extract of the fruit is used in medicine as an astringent. The oil extracted from the seeds is also used in country medicine.

Fl. June-Aug. Fr. Apr., May.

4. **D. tomentosa**, Roxb.; Fl. Br. Ind. iii. 564; Brandis Ind. Trees 433; Gamble Man. Ind. Timb. 460. Syn.—D. Melanoxylon, Roxb.; Brandis For. Flora 294. Vern. Tendú, Hind.

A moderate-sized tree with greyish-black bark, exfollating in regular rectangular scales; young parts covered with grey or rusty tomentum. Leaves alternate and subopposite, 3-6 by 2-5 in., broad-ovate, very coriaceous, hairy when young, glabrous above when mature, ultimately glabrescent below; secondary nerves 6-10 pairs, impressed as broad furrows on the upper surface; base cordate or rounded, rarely ouneate; petiole 3-5 in. long. Male flowers subsessile in short drooping cymes. Calyx funnel-shaped. Stamens 12-16, free. Female flowers solitary, larger than the male flowers. Calyx 4-5-gonal. Staminodes 8-10 or fewer, sometimes comnate in

pairs. Ovary hairy, 4-8-celled; styles 2-3. Fruit globose, 1-1.5 in. diam., glabrous, smooth, yellow when ripe; pulp yellow, sweet, aromatic. Seeds 4-8, compressed, oblong; albumen ruminated.

Common in the western half of the SAHARANPUR SIWALIKS. Occasionally found in the V. DUN SIWALIES.

Wood hard, of a whitish-pink colour, tough and fairly durable, used for building, shoulder-poles, mine-props and shafts of carriages. In some trees irregular masses of black ebony is found, which is very heavy, weighing 75-80 lbs. per c. ft. and is used for carving and other ornamental work. The ripe fruit is edible. The tree coppices very well, and throws out vigorous root-suckers.

Fl. May, June. Fr. Apr. and May, next year.

FAM. 51. STYRACEÆ; G. P. N. 103.

Trees or shrubs. Leaves alternate, simple, exstipulate. Flowers hermaphrodite, regular, usually white. Calux-tube more or less adnate to the ovary; limb 4-5toothed or truncate, persistent. Petals 4-5, united into a short tube or almost free. Stamens usually indefinite, attached to the corolla-tube in one or more series. Ovary inferior or superior, 2-5-celled, with 2 or more ovules in each cell. Style undivided, filiform; stigma small or capitate. Fruit drupaceous, usually 1-seeded. Seeds albuminous.

1. Symplocos, Linn.; G. P. n. l.

1. S. cratægoides, Ham.; Fl. Br. Ind. iii. 573; Brandis For. Flora 299, Ind. Trees 440; Gamble Man. Ind. Timb. 464. Vern. Lodh, Lodra, Jaunsar : Lodhra, Sans.

A large shrub or small tree; bark light-grey, corky, with long vertical furrows. Leaves 2-4 by 1-1.5 in., broad-elliptic or ovate. acuminate, sharply glandular-serrulate towards the apex, membranous, pilose beneath or glabrescent. Flowers white, '25 in. diam., fragrant, in cymose corymbs forming dense terminal or axillary panicles; bracts caducous. Calyx turbinate, lobes ciliate. Corolla 5-cleft nearly to the base. Stamens indefinite, connate in 5 bundles. Ovary inferior, 2-celled. Fruit '12-'3 in. long, obliquely ovoid or obovoid, crowned with the remains of the calyx-limb, usually 1-seeded. Embryo curved, axile.

JAUNSAR, TEHRI-GARHWAL, and the OUTER HIMALAYA, 3,-9,000 ft., e.g., Deoban, Lokhár, Bagur Block (Kathián), Tons Valley; Mautárgádh, Lúnágádh; Laduáköt, etc. Also Mothronwála swamp in the Dún.

Wood white, hard and close-grained, but warps and splits in seasoning; weight 45-54 lbs. per c. ft. It is, however, fairly durable and has been recommended for turning, and would do even for carving if properly seasoned. The leaves and bark give a yellow dye, the former being also lopped for fodder.

Fl. and new leaves May, June. Fr. July-Oct.

Order 6.—GENTIANALES.

FAM. 52. OLEACEÆ; G. P. N. 104.

Erect or scandent shrubs, or trees. Leaves opposite (except in Jasminum humile), simple 3-foliolate or imparipinnate, exstipulate. Flowers regular, in axillary or terminal cymose panicles, rarely solitary. Calyx free; limb 4-5- or more-toothed or -lobed, sometimes truncate, rarely 0. Corolla gamopetalous; lobes 4-5 or more or none, imbricate or valvate in bud; tube narrow. Stamens 2, inserted on, and included in, the corolla-tube; filaments usually very short. Ovary free, 2-celled, with usually 1-2 ovules in each cell; style simple, long or short; stigma simple or 2-lobed. Fruit succulent or

dry, berry-like capsular or drupaceous; seeds 1 or 2 in each cell, erect or pendulous; albumen fleshy or horny, or O.

Analysis of the Genera.

Corolla-lo	bes much i	im bri	cate.					
Scander	nt shrubs.	Fru	it a be	rry			1:	JASMINUM.
Erect s	mall tree.	Frui	ta 2-v	zalved	capsu	ıle	2.	NYCTANTHES
Corolla-lo	bes indupl	icate-	valvat	e or 0				
Leaves	imparipini	ate;	(fr. sa	maroi	d, ind	е-		
	nt) .				•		4.	FRAXINUS.
Leaves	simple.							
Fruit	a capsule						3.	Syringa.
Fruit	a drupe.							
Inf	florescence	axille	ary;	etals:	more	or		*
	ess connat						5.	LINOCIERA
Int	florescence	axill	ary (except	in (0.		
9	glanduliter	a); c	orolla	with	a sho	rt		
i	ube	•					6.	OLEA.
Int	florescence	term	inal ; c	orolla	funne	el-		
	haped		. ′				7.	LIGUSTRUM.

1. Jasminum, Linn.; G. P. n. 1. Shrubs, usually scandent. Leaves opposite (except in J. humile), simple 3-foliolate or imparipinnate; petiole usually articulated. Flowers fragrant, in axillary or terminal cymes; bracts sometimes petaloid. Calux 5-9-fid: tube funnel-shaped: teeth long or short or 0. Corolla white pink or yellow; tube narrow; lobes spreading, imbricate in bud. Stamens 2, included in the tube; connective usually produced and triangular. Ovary 2-celled; ovules basal, usually 2 in each cell; style cylindrical; stigmas 2, linear. Berry 2-lobed, or entire by the failure of 1 carpel; seed usually 1 in each carpel, erect, exalbuminous.

Analysis of the Species.

Leaves opposite; flowers white. Leaves simple. Cymes dense: flowers sessile, calyxteeth nearly as long as the corolla-1. J. pubescens, tube Cymes lax: flowers pedicellate; calvxteeth less than half the length of the 2. J. arborescens. corolla-tube Leaves imparipinnate. 3. J. dispermum. Calvx-teeth very short, triangular Calyx teeth long, linear. Branches long and weak; corollalobes small 5. J. officinale. Branches short and stiff; corollalobes large 6. J. grandiflorum. Leaves alternate, imparipinnate; flowers vellow (calvx-teeth very short) . 4 J. humile.

1. **J. pubescens,** Willd.; Fl. Br. Ind. iii. 592; Brandis Ind. Trees 449; Gamble Man. Ind. Timb. 468. Syn.—J. hirsutum, Willd., Brandis For. Flora 312. Vern. Chaméli, Hind.

A scandent shrub; branches and young parts villous. Leaves opposite, simple, 1-3 by '7-1'5 in., ovate, acuminate, entire, more or less pubescent beneath; base rounded or cordate, rarely slightly cuneate; petiole '2-'4 in. long, pubescent. Flowers scented, white, subsessile, in compact short pedunculate cymes. Calyx-teeth usually 7-9, linear, hairy, nearly as long as the corolla-tube. Corolla tube '7-'8 in. long; lobes oblong-lanceolate, shorter than the tube. Fruit of 1 or 2 carpels, globose or elliptic, surrounded by the calyx-teeth, black when ripe.

Common in the Dún, especially in hedges outside villages, also along the foot of the Saháranpur Siwaliks.

- Fl. Dec.-Apr. and also during the rains.
- 2. **J. arborescens**, Willd.; Fl. Br. Ind. iii. 594; Brandis For. Flora 311, Ind. Trees 450; Gamble Man. Ind. Timb. 467. Vern. Chaméli, Hind.

A large shrub, usually suberect. Leaves opposite, simple, 3-5 by 2-3 in., ovate, acute or acuminate, entire, seft-tomentose when young, glabrate afterwards; base broadly rounded, sometimes cordate; petiole '5-8 in. long. Flowers white, fragrant, in lax terminal trichotomous cymes; pedicels '2-3 in. long; bracts '2 in., linear,

Calyx-lobes 5-6, sometimes more, linear, '1-'15 in. long. Corolla-tube '5 in., lobes usually 9, '7 in. long, lanceolate, acute. Fruit generally of 1 carpel, '4-'6 in. long, ellipsoid, black when ripe.

Fairly common in the Western Dún, e.g., Ámbári, Kálsi, etc.; also along the foot of the Saháranpur Siwaliks: Ránipur, Bádsháhibágh, etc.

Fl. Apr., May. Fr. June, July.

Var. latifolia, Roxb. is scandent. Found about Ambári, W. Dúw.

3. **J. dispermum**, Wall.; Fl. Br. Ind. iii. 602. Brandis For. Flora 312, Ind. Trees, 452.

A glabrous scandent shrub; branches 4-sided. Leaves opposite, imparipinnate, upper often 1-foliate. Leaflets 3-5, cordate-lanceolate, acuminate, entire, coriaceous, glabrous, 3-5-nerved at the base, terminal 3-4 by 1'4-1'8 in., lateral smaller and very shortly petioluled. Flowers white, fragrant, both in few-flowered axillary cymes and many-flowered elongated terminal panicles; pedicels 0-3 in. Calyx-teeth '0-4 in., triangular. Corolla-tube '5-'7 in. long; lobes '2-'3 in., elliptic or ovate. Berries '5 in. long, ellipsoid, dark-purple when ripe.

Bindál-nálá and other ravines in the Dún, less common than J. pubescens. Also Chatragádh in JAUNSAB.

Fl. May, June. Fr. Sept., Oct.

4. **J. humile,** Linn.; Fl. Br. Ind. iii. 602; Brandis Ind. Trees 452; Gamble Man. Ind. Timb. 468. Syn.—*J. revolutum*, Sims.; Brandis For. Flora 313. Vern. *Shanjoi*, *Shunjai*, Jaunsar.

An erect small shrub, wholly glabrous; branches angular, green; bark soft. Leaves alternate, imparipinnate. Leaflets 1-5 pairs, 2-3 by '7-1'2 in., variable in size, ovate or ovate-lanceolate, the terminal usually the largest. Flowers dimorphic, yellow, fragrant, in short terminal compound corymbose cymes. Calyx-teeth 5, very short. Corolla-tube '5-'8 in. long; lobes 5, ovate, obtuse. Berries ellipsoid, '3-'4 in. long.

Common in the OUTER HIMALAYA, JAUNSAR, and TEHRIGARHWAL, 4,000-9,500 ft.

Fl. Apr.-June. Fr. Sept.-Dec.

5. **J. officinale**, Linn.; Fl. Br. Ind. iii.603; Brandis For. Flora 313, Ind. Trees 452; Gamble Man. Ind. Timb. 467. Vern. Höl-báli. Jaunsar.

A large twining shrub, branches long, weak, dark-green, slightly ribbed. Leaves opposite, imparipinnate; rachis channelled. Leaflets 3-7, 2-3 in. long, rhomboid or lanceolate, the terminal largest. Flowers white, fragrant, about '8 in. long, in few-flowered corymbose terminal cymes; pedicels 0-7 in. Calyx-teeth linear, very variable in length. Corolla-tube '6 in. long; lobes 5, '3 by '2 in., acute. Berries '3 in. long, subglobose.

- JAUNSAB and TEHRI-GARHWAL, 4-9,000ft.; Korwá, Deoban, Mundáli, etc.
 - Fl. May, June. Fr. Oct., Nov.
- 6. **J. grandiflorum**, Linn.; Fl. Br. Ind. iii. 603; Brandis For. Flora 313, Ind. Trees 452; Gamble Man. Ind. Timb. 469. Vern. Chambéli, Jaunsar; Joi, Garhwal.

A large glabrous scandent shrub, suberect in early life; branches ribbed. Leaves opposite, imparipinnate; leaflets 3-7, sessile, the upper pairs generally confluent with the terminal leaflet; petiole marginate. Flowers white, with faint pink streaks outside, delightfully fragrant, in lax terminal cymes, rarely solitary and axillary; pedicles slender, '3-1 in. long. Calyx-teeth linear, half to two-thirds the length of the corolla-tube. Corolla-tube about 1 in.; lobes usually 5, about '5 in. long, elliptic. Berries of 2 carpels, ellipsoid, '3 in. long.

JAUNSAR and TEHRI-GARHWAL up to 8,500 ft., e.g., Mundáli, Deotá, Lambátách, etc., especially conspicuous at Bodyár.

Fl. May-July.

2. Nyctanthes, Linn.; G. P. n. 3.

 N. Arbor-tristis, Linn.; Fl. Br. Ind. iii. 603; Brandis For. Flora 314, Ind. Trees 442; Gamble Man. Ind. Timb. 469. Vern, Kúrri, Dún; Harsingár, Hind.

A small deciduous tree with quadrangular branches and grey or greenish-white rough bark. Leaves opposite, 4-5 by 2.5-3 in., ovate, acute, coriaceous, covered with stiff white hairs; base rounded or cuneate; petiole '2.5 in. long. Flowers sweet-scented, sessile, 3.7 together in pedunculate heads which are arranged in short trichotomous cymes; bracts elliptical. Calyx-tube 2 in., minutely 4-5-toothed. Corolla-tube '3.5 in. long, cylindrical, orange-red; limb white, spreading; lobes 5-8, '2.3 in. long, emarginate, contorted in bud. Anthers 2. subsessile, inserted near the mouth of the corolla-

tube. Ovary 2-celled; ovule 1 in each cell, erect. Capsule '3-'5 inlong, orbicular, compressed, chartaceous, 2-celled; seeds exalbuminous.

Extremely common in the forests of the Saháranpur Siwaliks, and in some parts of the Dún, as on the Nágsidh Hill and the southern slopes of the Himalaya, e.g., at Málköt, Rájpur, etc. Also at Kálsi in Jaunsar. Cultivated in gardens for its flower.

The wood is used only for fuel. The leaves are used for polishing wood and also in country medicine as a febrifuge. The flowers are collected and dried to separate the white corolla-lobes which are then winnowed out, leaving the tubes, from which an orange dye is extracted.

Fl. Aug.-Oct. Fr. Cold season.

3. Syringa, Linn.; G. P. n. 6.

 S. Emodi, Wall.; Fl. Br. Ind. iii. 605; Brandis For. Flora 30b, Ind. Trees 445; Gamble Man. Ind. Timb. 470. Vern. Shaphroi, Jaunsar.

A large deciduous shrub; branches lenticellate. Leaves 3-4 by 1.5-2 in., elliptic-oblong, short-acuminate, entire, slightly pubescent beneath when young, glabrate and pale beneath when mature; base acute; petiole 3-1 in. long. Flowers whitish or purple, scented, in dense-flowered thyrsoid panicles. Calyx subtruncate, about 1 in. long, persistent, nearly glabrous. Corolla trumpet-shaped; tube 2-4 long; lobes 4, shorter than the tube, valvate, linear-oblong, tip generally inflexed. Stamens 2, near the top of the corolla-tube; anthers half-exserted. Ovary 2-celled; ovules 2 in each cell, pendulous; stigma bifid. Fruit a coriaceous capsule, 5-7 in. long, cylindrical, acute, slightly bent, loculicidally 2-valved; seeds pendulous, linear-oblong, flat, ridged along the middle, winged all round.

TEHRI-GARHWAL, JAUNSAR, and SIMLA HILL STATES, 8,-11,000 ft.: Jádi and Bájámárá Blocks, Cháchpur Range, etc.

Wood white, even and close-grained. The leaves are used as fodder for goats; cultivated in gardens for its flower.

Fl. May-July. Fr. Sept., Oct.

4. Fraxinus, Linn.; G. P. n. 7.

1. **F. floribunda**, Wall.; Fl. Br. Ind. iii. 605; Brandis For. Flora 302, Ind. Trees 443; Gamble Man. Ind. Timb. 471.

A large deciduous tree: bark ashy-grey: smooth on young poles, corky and deeply furrowed on mature trees. Leaves opposite, imparipinnate : rachis 5 8 in. long. Leaflets usually 7, less frequently 5 or 9, lateral opposite, 3-5 by 1-3 in., ovate oblong elliptic or lanceolate, usually long-acuminate, falcately serrate, membranous, glabrous above, pilose on the nerves beneath when young: main lateral nerves about 12 pairs, slender, joined by reticulated secondary nerves: petiolules 2-5 in. long. In florescence a large terminal panicle; pedicels fascicled on the branches of the panicle. Flowers about '15 in. long, generally 2-sexual. Calyx minute, acutely 4-toothed, somewhat enlarged in fruit. Corolla-lobes 12 in. long, linear-oblong, narrowed at both ends, induplicate-valvate in bud. Stamens near the base of the corolla tube; filaments about 'l in. long. Ovary 2-celled; stigma 2-hd; ovules 2 in each cell, pendulous. Fruit an oblanceolate samara. 1-1.5 by 2-25 in., including the wing. Seed solitary.

Cultivated in Jaunsar about Chakrata and in Tehri-Garhwal; also found indigenous in places $e.\ g.$, at Phaphrota below Deoban, Bear Garden near Chakrata, and at Kúlni; not very common.

Wood white, with a light reddish tinge, moderately hard and tough; no heartwood; annual rings distinct; weight 48 lbs. per c. ft. It is used for oars, ploughs, jhampan-poles, etc.

Fl. usually Apr., May. Fr. Aug., Sept.

5. Linociera, Swartz; G. P. n. 13.

1. L. intermedia, Wight: Fl. Br. Ind. iii. 609; Brandis Ind. Trees 448; Gamble Man. Ind. Timb. 473.

A small tree. Leaves 4-8 by 2-3 in., elliptic-oblong, acute at both ends, chartaceous, glabrous; main lateral nerves 10·14 pairs; reticulations prominent; petiole '5 to 1·2 in. Inflorescence a dense glabrous compound trichotomous panicle, generally axillary, sometimes from the middle of the internodes; bracts lanceolate, generally minute. Flowers whitish, male or 2-sexual, sessile or nearly so. Calyx-lobes '1 in., ovate, glabrous. Petals 4, '12-'2 in. long, narrowly oblong, slightly connate in pairs. Anthers sessile or nearly so. Ovary glabrous. Drupe '5-'7 by '3 in.

Only found on the edges of the Mothronwala swamp and is likely to occur in similar other localities in the Dun.

Wood white, moderately hard and close-grained.

Fl. Mar.-May. Fr. Rainy season,

6. Olea, Linn.; G. P. n. 16.

Trees or shrubs. Leaves opposite, simple, entire or toothed. Flowers often unisexual and diceious, generally in terminal panicles. Calyx 4-toothed or-lobed, or truncate. Corolla-tube short, lobes 4 or 0. Stamens 2, epipetalous and exserted, or hypogynous (when the corolla is wanting); anthers oblong. Ovary 2-celled; ovules 2 in each cell; style short. Fruit a drupe, ellipsoid; endocarp hard; exocarp pulpy. Seed solitary, pendulous; albumen fleshy.

Analysis of the Species.

Lateral nerves distinct, glar dular at the axils; leaves wholly glabrous . . 2. O. glandulifera.

1. **O. cuspidata,** Wall.; Fl. Br. Ind. iii. 611; Brandis For. Flora 307, Ind. Trees 445. Syn.—O. ferruginea, Royle; Gamble Man. Ind. Timb. 474. Vern. Káu, Jaunsar; Kahu, Hind.

A middle-sized tree; bark thin, smooth when young, exfoliating in narrow strips when old. Leaves 2-4 in. long, oblong-lanceolate, cuspidate, entire, very coriaceous, dark-green and shining above, thickly clothed beneath with a dense film of minute red scales; margins slightly recurved; midrib prominent; petiole about 2 in. Flowers bisexual, whitish, in axillary trichotomous cymes, 1-2 in. long. Calyx nearly truncate or with 4 short teeth. Corolla deeply divided; lobes 1 in., elliptic, obtuse or acute with a ridge along the middle, induplicate-valvate in bud. Anthers oval, dehiscing laterally. Style short; stigma bifid. Drupe 2-3 in. long, ovoid, black when ripe, supported by the remains of the calyx; endocarp bony; pulp scanty, oily.

Fairly common in JAUNSAR and the OUTER HIMALAYA, 3.-6,000 ft.; cultivated in Dehra.

Sapwood whitish; heartwood light-brown to nearly black, extremely hard, often beautifully mottled; weight 65-82 lbs. per c. ft. It polishes well and is much prized for turning, for combs and for agricultural implements. Fairly straight branches are in great

demand for the purpose of making into walking sticks. The fruit is eaten, and oil can be extracted from it. The leaves are heavily lopped for fodder.

Fl. Apr., May, and sometimes in September. Fr. Aug.-Nov.

2. **O.** glandulifera, Wall.; Fl. Br. Ind. iii. 612; Brandis For. Flora 309, Ind. Trees 446; Gamble Man. Ind. Timb. 474. Vern. Gair. Gaild. Mélköt.

A moderate-sized tree; branches lenticellate; bark of stem rough. Leaves 4 by 2 in., ovate-lanceolate, long-acuminate, entire, wholly glabrous; margins slightly undulate; base cuneate; main lateral nerves 9-12 pairs, slender, with glands at their axils on either side of the midrib; petiole '5-1 in. long. Flowers cream-coloured, in terminal or lateral compound trichotomous cymes. Calyx 4-toothed. Corolla deeply divided; lobes valvate, elliptic, '1 in. long. Anthers, large. Ovary glabrate. Drupe '5 in. long, ovoid, somewhat oblique, acute at the apex; endocarp bony.

Fairly common along the OUTER HIMALAYAN TRACTS between 2,500 and 6,000 ft.: Málköt Forest, Paléd, above Rajpur, Tons Valley near Kálsi, etc. Also Mothronwála swamp in the Dún, 1,900 ft.

The wood is reddish-grey, hard and durable, weighing 54 lbs. per c. ft. It takes a good polish and is avoided by insects. It is used in construction, turnery and agricultural implements. The bark is used in medicine, and the leaves are lopped for fodder.

Fl. Apr., May, occasionally during the rains. Fr. Cold season.

7. Ligustrum, Linn.; G. P. n. 17.

1. **L. compactum,** Hook. f. & Th.; Fl. Br. Ind. iii. 616'; Brandis For. Flora 310, Ind. Trees 447; Gamble Man. Ind. Timb. 476. Vern. Kakurchha, Jaunsar.

A small tree with grey bark; branches often lenticellate. Leaves 3-5 by 1-2 in., elliptic-lanceolate, coriaceous, glabrous, shining above; petiole 2-3 in. long. Flowers white, subsessile, in compound racemes, which are arranged in terminal panicles. Corolla-tube short, funnel-shaped; lobes oblong, induplicately valvate. Anthers half-exserted. Ovary 2-celled, with 2 ovules in each cell; style of varying lengths, the longest reaching to the base of the anthers; stigma nearly simple. Fruit numerous, '2-3 in. long, cylindrical, often slightly curved.

JAUNSAE and TEHRI-GARHWAL, 4,-9,000 ft.; Karambá Peak (Sir D. Brandis), Lokhár, Kathián, Koti, Ghutugádh, Binálgádh, etc.; cultivated in Dehra (Kowlágarh).

Wood white, moderately hard, close-grained and durable. The leaves are lopped for fodder.

Fl. Apr.-June. Fr. Nov.-Feb.

FAM. 53. APOCYNACEÆ; G. P. N. 106.

Erect or climbing shrubs, or trees, rarely herbs, usually with milky juice. Leaves entire, commonly opposite, sometimes whorled, very rarely alternate. Flowers regular, hermaphrodite, solitary or in cymes. Calux inferior; sepals free or slightly connate at the base, generally imbricate in bud. Corolla hypogynous. gamopetalous, rotate or salver-shaped; lobes spreading. contorted or twisted (rarely valvate) in bud. Stamens 5. inserted on the tube, alternating with the corollalobes; anthers opening inward by longitudinal slits, sometimes spurred downwards: connective often adhering to the stigma; pollen granular. Ovary 1-celled, with 2 parietal placentas, or 2-celled with axile placentas, or of two distinct or more or less connate carpels; ovules 2 to many in each, rarely solitary; style simple or divided only at the base. Fruit a drupe or a berry, or of 2 drupes, berries or fallicles. Seeds pendulous, usually bearing a tuft of long silky hairs; albumen fleshy or scanty, rarely 0.

Analysis of the Genera.

A. Leaves in pairs, opposite.

B. Seeds naked.

Spinous shrubs, generally erect; fr. a 2-or few-seeded succulent berry .

Unarmed erect shrubs; fr. of two 1-

many-seeded dry or fleshy follicles . 3. TABERNÆMONTANA.

1. CARISSA.

B'. Seeds comose.

C. Trees or large erect shrubs.

Anthers included, free; mouth of the corolla-tube naked, white .

Anthers exserted, adherent to the stigma; mouth of the corolla-tube with scales, usually orange.

C'. Climbing shrubs.

Corolla-lobes narrow; carpels distinct.

Tips of corolla lobes deflected; seeds oft in beaked .

S. ICHNOCARPUS.

seeds often beaked . . 8. ICHNOCARPUS.

Tips of corolla-lobes not deflected; seeds not beaked . 9. TRACHELOSPERMUM.

Corolla-lobes broad; carpels at first connate . . 5. VALLARIS.

A'. Leaves whorled; seeds comose;

anthers included.

Trees. Corona absent; carpels distinct 2. Alstonia.

Erect shrubs. Corona present; carpels at first connate . 7. Nerium.

1. Carissa, Linn.; G. P. n. 17.

1. C. spinarum, A.D.C., ; Fl. Br. Ind. iii. 631; Brandis Ind. Trees 455; Gamble Man. Ind. Timb. 480. Syn.—C. diffusa, Roxb., Brandis For. Flora 321. Vern. Karaunda, Hind.

A small thorny evergreen shrub with light-grey bark and green branchlets; spines 5-1 in. long, often forked, generally at the base of the branches. Leaves opposite, 1-1-5 by '7-1 in., ovate, acute, mucronate, glabrate or pubescent beneath, coriaceous, dark-green and shining above. Flowers white, scented, in few-flowered corymbose cymes at the ends of the branches. Calyx-teeth 5, lanceolate, ciliate. Corolla-tube 5 in. long, cylindrical; lobes 5, elliptic-lanceolate, slightly shorter than the tube. Stamens included in the corolla-tube. Ovary 2-celled, ovules 2 in each cell. Berry subglobose or elliptic, '2-'3 in. long, shining or pruinose, dark-purple and juicy when ripe. Seeds 2, concavo-convex, not hairy.

Extremely common and gregarious in scrub jungles along the foot of the Saháranpur Siwaliks and in open glades and stony soils (e.g., Tháno) in the Dún; also found in the lower valleys, up to 4,000 ft., in Jaunsab and Tehbi-Garhwal.

Wood hard, smooth and close-grained, and is used for turning and for making combs. It is an excellent fire-wood. The branches are in great demand for dry fences, and the leaves are greedily eaten by sheep and goats. The ripe berries have a sub-acid sweet taste, and are much eaten by men and birds.

Fl. Apr. June. Fr. Cold season.

C. Carandas, Linn.; Fl. Br. Ind. iii. 630. Vern. Karaunda, Hind.—is cultivated in gardens at Dehra and Saháranfur. It resembles C. spinarum in habit, but is usually a taller shrub with larger leaves, and much larger and usually 4-seeded fruits.

2. Alstonia, Br.; G. P. n. 44.

I. A. scholaris, Br.; Fl. Br. Ind. iii. 642; Brandis For. Flora 325, Ind. Trees 459; Gamble Man. Ind. Timb. 483. Vern. Sátián, Chhátián, Chhátwán, Sátni, Hind.

A tall evergreen tree with grey bark and verticillate branches; stem often fluted or buttressed. Leaves in whorls of 4-7, 4-8 by 1-15 in., obovate elliptic-oblong or oblanceolate, subsessile or narrowed into a short petiole '25-5 in. long, coriaceous, glabrous and shining above, dull and pale-green beneath; lateral nerves numerous, straight, terminating in an intramarginal vein. Flowers greenishwhite, in compact umbellately-corymbose cymes, the umbels whorled. Calyx small, 5-lobed. Corolla '3-5 in. diam., villous inside; lobes rounded, spreading, twisted in bud. Stamens above the middle of the corolla-tube, included; anthers acute. Ovary of two distinct carpels. Fruit of two long slender follicles over a foot long and '2 in. diam., hanging in clusters. Seeds '3 in. long, slender, flattened, peltately attached, densely ciliate with long hairs all round.

Not very common. Has been met with on the banks of the Bidhálná Ráu and at Kalimatti, Tháno, Rikhikesh, Gularparáo, Nakraunda and Kálsi.

Wood whitish, even-grained, porous, soft, light, but seasons badly; weight about 30 lbs. per c. ft. It is used in places for teaboxes and other kinds of packing-cases, and for scabbards, coffins, blackboards, etc. The bark is bitter and possesses valuable medicinal properties.

Fl. Dec.-Mar. Fr. May, June.

3. Tabernæmontana, Linn.; G. P. n. 46.

1. **T. coronaria**, Br.; Fl. Br. Ind. iii. 646; Brandis For. Flora 322, Ind. Trees 460; Gamble Man. Ind. Timb. 485. Vern. *Chándni*. Dún.

An evergreen shrub, 10-15 ft. high, dichotomously branched, with silvery-grey bark. Leaves 4-6 by 1-1.5 in., elliptic-oblong, acuminate, rather coriaceous, shining-green above, pale beneath; margins undulate, narrowed into a short petiole '25-5 in. long. Flowers pure white, fragrant, often (especially under cultivation) double. Calyx-lobes short, broad-ovate, acute, glandular within. Corollatube '7-1 in. long, slightly inflated in the middle; limb 1-1.5 in. diam., mouth glandular; lobes obtuse, margins overlapping, curled. Stamens inserted about the middle of the tube; anthers acuminate. Carpels 2, distinct, glabrous; stigma 2-lobed. Fruit of two 3-ribbed somewhat fleshy cylindrical follicles, 2-3 in. long, sessile or nearly so, recurved, deep-red or orange inside. Seeds 3-6, oblong, with a fleshy red aril.

Valleys in the OUTER HIMALAYA, e.g., at Tháno and adjoining places, also about Rájpur. It is cultivated in gardens throughout India for its large fragrant flower.

Fl. May-Aug. Fr. Cold season.

4. Holarrhena, Br.; G. P. n. 50.

1. **H. antidysenterica**, Wall.; Fl. Br. Ind. iii. 644; Brandis For. Flora 326, Ind. Trees 459; Gamble Man. Ind. Timb. 484. Vern. Kúra, Hind.

A small deciduous tree with rough brown bark, exfoliating in irregular flakes. Leaves opposite, 6-12 by 2-5 in., elliptic-oblong. acute or acuminate, sub-coriaceous, glabrous; lateral nerves 10-14 pairs; base obtuse or cuneate; petiole 2 in. or less. Flowers white or cream-colour, slightly scented, 1-1.5 in. across, puberulous, in terminal corymbose cymes which are 3-6 in. in diam. Calux deeply 5. partite; lobes small, lanceolate, acuminate, with glands inside at their Corolla-tube 3.5 in. long, cylindrical, swollen at the base round the anthers, throat contracted, naked; lobes as long as the tube, oblong, spreading, overlapping to the left. Anthers subsessile, inserted near the base of the corolla-tube; cells rounded at the base. Carpels 2, distinct: ovules numerous: style short, filiform: stigma oblong. Fruit of 2 distinct divaricate follicles, 8-16 by 2-4 in., spreading and incurved, smooth, usually with white specks. Seeds numerous, 5 in. long, linear; hairs silky, of a brownish-grey colour, 1.5 to 2 in. long.

Very common in the Dún and Saháranpur Forests; also in valleys up to 4,000 ft. in Jaunsar and Tehri-Garhwal.

The wood is white, soft and even-grained; weight about 40 lbs. per c. ft. It is said to be used at Saháranpur for carving. It is also used for turning and furniture, and beads are made of it to be worn round the neck as a charm. The bark, leaves and seeds are used in medicine, especially the first for dysentery, whence the specific name.

New leaves Apr., May. Fl. May, June. Fr. Cold season.

5. Vallaris, Burm.; G. P. n. 56.

1. **V. Heynei**, Spreng.; Fl. Br. Ind. ii. 650; Brandis Ind. Trees 462; Gamble Man. Ind. Timb. 486. Syn.—V. dichotoma, Wall.; Brandis For. Flora 327. Vern. Dudhi-bel, Safed-bel, Dún.

A glabrous twining shrub; bark ash-coloured. Leaves opposite, 2-4 by 1-1.5 in., elliptic-oblong, acuminate, gland-dotted, glossy above; petiole '3-6 in., with glands at the axils. Flowers purewhite, '7 in. across, fragrant, in lateral dichotomous cymes; pedicels slender. Calyx 5-partite; segments ovate-oblong, obtuse. Corollalimb rotate, spreading; tube short, with a broad throat. Stamens woolly, inserted at the top of the corolla-tube; filaments short; anthers exserted, connivent, forming a cone with the stigma at the apex; cells rigidly spurred. Carpels 2, at first connate; style filiform. Fruits 4-6 by 1-1.5 in., tapering from a rounded base; pericarp thick. Seeds numerous, beaked, '6 in. long, with a tuft of hairs three times their length at the hilum.

Common in the Dún and Saháranpur Forests; also in low valleys in Jaunsar and Tehri-Garhwal.

The switchy branches are used for baskets in the Saháranpur District.

Fl. Dec.-Apr. Fr. Jan.-Apr., next year.

6. Wrightia, Br.; G. P. n. 61.

1. **W. tomentosa**, Roem. & Sch.; Fl. Br. Ind. iii. 653; Brandis For. Flora. 323, Ind. Trees 461; Gamble Man. Ind. Timb. 487. Vern. *Dúdhi*, Hind.

A small deciduous tree with grey corky bark; extremities tomentose. Leaves opposite, distichous, 3-6 by 1 '5-3 in., elliptic, caudate-acuminate, rarely obscurely serrulate, rather membranous, velvety-tomentose often on both surfaces, always beneath, narrowed into a petiole '2-3 in. long; lateral nerves 10-16 pairs. Flowers 1 in across, in many-flowered corymbose terminal cymes; bracts deci-

duous. Calyx short, with 5-10 scales inside at the base; lobes rounded, half the length of the corolla-tube. Corolla pale-yellow with a fleshy orange-coloured corona of scales; lobes oblong, over-tapping to the left. Stamens inserted at the top of the corolla-tube; filaments short and broad, continued into a broad tapering connective; anthers sagittate by the cells being spurred at the base, adherent to the stigma. Ovary of 2 connate carpels; style filiform; stigma ovoid. Fruit of 2 connate follicles, 8-12 by 5-7 in., straight, cylindrical, laterally compressed, rough with white specks; follicles separating before dehiseing. Seeds numerous, 5-7 in., slender, each with a tuft of pure-white silky hairs at the lower end.

Fairly common in the Dún and Sahábanpur Forests, and also found in the lower valleys (e. g., Binálgádh,—Sir. D. Brandis, Dhárágádh, etc.) in Jaunsar. Also in outer Himalayan open valleys up to 4,000 ft. in Tehri-Garhwal.

Wood yellowish-white, moderately hard, close-grained, easy to work; heartwood not distinct; weight about 40 lbs. per c. ft. Used in turning, and carved into bowls, plates, combs, picture-frames, etc., at Saháranpur. The bark of the stem and the roots are given as an antidote to snake-bite and the sting of scorpions. The Nepalese are said to use the milky juice to stop bleeding.

New leaves Apr., May. Fl. May, June. Fr. Cold season.

7. Nerium, Linn.; G. P. n. 62.

1. N. odorum, Soland.; Fl. Br. Ind. iii. 655; Brandis For. Flora 328, Ind. Trees 462; Gamble Man. Ind. Timb. 487. Vern. Kanér, Hind.

An evergreen shrub with silvery-grey bark. Leaves usually in whorls of 3, 4-6 by '5-1 in., linear-lanceolate or oblong, thickly coriaceous, acuminate, smooth dark-green and shining above, rough and dotted beneath; midrib stout; lateral nerves numerous, parallel and transverse; petiole short. Flowers 1'5 in. diam., red white or rose-coloured, generally sweet-scented, double under cultivation, in large terminal racemose cymes. Sepals broad-subulate. Corolla funnel-shaped; lobes spreading, overlapping to the right. Corona-appendages laciniate into numerous irregular segments. Stamens near the top of the tube; anthers sagittate, conniving around and adhering to the stigma; cells with long twisted appendages. Fruit 6-7 by '3-'4 in., rigid. Seeds linear, ribbed, villous with, and having a coma of, greyish-brown hairs.

Found in dry Ráu beds in the Saháranpur Siwaliks, e.g., the Chápri and Ráni Ráus; not very common.

"The bark and root are poisonous, and the leaves are used in native medicine."—Mr. J. S. Gamble.

Fl. Apr.-June and often throughout the year. Fr. Cold season.

8. Ichnocarpus, Br.; G. P. n. 73.

I. frutescens, Br.; Fl. Br. Ind. iii. 669; Brandis For.
 Flora 327, Ind. Trees 464. Vern. Bel Kámú, Dún and Saháranpur;
 Kali Dúdhi, Hind.

A twining shrub; extremities and under surface of leaves rusty-pubescent. Leaves 2-3 by 1·5-2 in., elliptic-oblong or ovate-lanceolate, acute or acuminate, glabrate and dark-green above, more or less pubescent beneath; petiole '2 in. Flowers '2-'3 in. diam., greenish-white, more or less scented, in axillary and terminal leafy cymose-panicles. Calyx 5-cleft, with small glands inside; lobes ovate. Corolla hypo-crateriform, about '2 in. diam., naked inside; tube swollen round the included anthers; throat contracted, villous; lobes narrowed, hairy inside, ciliate, overlapping to the right. Anthers sagittate. Fruit of two distinct slender cylindrical follicles, 3-6 by '15 in. Seeds numerous, '5 in. long, slender, pendulous, each with a tuft of scanty white hairs at the hilum.

Common in the Dun and Saharanpur Forests.

The thin switchy branches are used for making baskets in the Saháranpur District, and fishing-traps in Bengal. The root is often used as a substitute for Sarsaparilla.

Fl. Aug.-Nov. Fr. Feb.-Apr.

9. Trachelospermum, Lemaire; G. P. n. 82.

1. **T. fragrans**, Hook. f.; Fl. Br. Ind. iii. 667; Brandis Ind. Trees 464; Gamble Man. Ind. Timb. 489. Syn. *Ichnocarpus fragrans*, Wall.; Brandis For. Flora, 327.

A tall climber, young parts pilose; old stems strongly tubercled. Leaves 3-5 by 1-1.5 in., elliptic-oblong, acuminate, sub-coriaceous, shining above; petiole '15.3 in. long. Flowers white, fragrant, in compound trichotomous corymbose cymes. Corolla salvershaped, with a campanulate mouth; tube '3 in. long; lobes oblong, hairy near the base, tips not deflected, overlapping to the right, twisted to the left in bud. Anthers spurred at the base. Follicles 6-9 in. long, cylindrical, acuminate, incurved. Seeds '7 in, long, compressed, smooth, having a coma of white hairs.

JAUNSAR and TEHEI-GARHWAL in moist shady ravines, 3,-6,000 ft.; Rámsu valley, Sendrá, Mautárgádh, etc. Also along the banks of the Ré-nadi and in the Mothronwala swamp in the Dún.

Might possibly be used for the same purposes as Ichnocarpus frutescens.

Fl. Apr.-June. Fr. Oct.-Dec.

The following plants belonging to this Family deserve mention:—

- 1. Rauvolfia serpentina, Benth.; Fl. Br. Ind. iii. 632.—A small shrub about 2 ft. high. Leaves 3-7 in. long, elliptic or obovate-lanceolate, short-petioled, soft. Flowers pink, about 5-7 in. long, in long-peduncled many-flowered cymes which are 1-2 in. long. Black when ripe. Found at Lachiwála in the Dún. Fl. Nov., Dec.—G. P. n. 20.
- 2. Thevetia neriifolia, Juss.; Vern. Pila Kanér.—An evergreen shrub with narrow-linear leaves resembling those of Nerium odorum, and large fragrant yellow flowers. Fruit a 2-celled drupe. Cultivated for its flower.—G. P. n. 27.
- 3. Plumeria acutifolia, Poiret; Fl. Br. Ind. iii. 641; Vern. Gülächin, Gülchin, Dün. A soft-wooded small deciduous tree with thick fleshy branches and scattered leaves. Flowers white, fragrant, yellow in the centre. Fruit follicular; seeds winged. It is a native of tropical America but has been naturalised in many parts of India, and is much planted about temples and Mahomedan burial grounds throughout N. India.—G. P. n. 41.

FAM. 54. ASCLEPIADACEÆ; G. P. N. 107.

Herbs or shrubs, often climbing, generally with milky juice and noted for strong fibre. Leaves opposite, simple, entire, exstipulate. Flowers regular, bisexual, 5-merous, usually in axillary cymes. Calyx inferior, deeply 5-lobed or divided; segments imbricate. Corolla-tube short; lobes valvate or twisted-imbricate, with a corona of scales at the throat called the outer or corolline corona. Stamens 5, rarely free, generally connate into a short fleshy column which usually bears a ring or series of processes that are attached to the filaments or to the

back of the anthers: this is called the *inner* or *staminal* corona. (Ohly in rare cases are both coronas present or both absent.) Anthers adnate to the stigma by the connective; pollen in granular or waxy masses which are usually united in pairs (one belonging to each contiguous anther) to glands situated at the angles of the stigma. Ovary superior; carpels 2, distinct; ovules many, in 2 series in each carpel; styles 2, uniting in the stigma which is 5-angled. Fruit of two follicles, or of only one by abortion; seeds usually compressed or flat, with a tuft of silky hairs (coma) at the hilum; albumen copious.

Analysis of the Genera.

Filaments free; pollen-masses granular, in pairs in each cell. Coronal scales free, not aristate
Coronal scales free, not aristate Coronal scales connate into a lobed ring; lobes long-aristate Filaments connate into a staminal tube; pol. masses waxy, solitary in each cell. Anthers with a membranous tip. Stem erect. Corolla-lobes valvate; follicles stout, oblique 3. CALOTROPIS.
Coronal scales connate into a lobed ring; lobes long-aristate
lobes long-aristate
Filaments connate into a staminal tube; polmasses waxy, solitary in each cell. Anthers with a membranous tip. Stem erect. Corolla-lobes valvate; follicles stout, oblique . 3. CALOTROPIS.
polmasses waxy, solitary in each cell. Anthers with a membranous tip. Stem erect. Corolla-lobes valvate; follicles stout, oblique . 3. CALOTROPIS.
Anthers with a membranous tip. Stem erect. Corolla-lobes valvate; follicles stout, oblique . 3. Calotropis.
Stem erect. Corolla-lobes valvate; follicles stout, oblique 3. CALOTROPIS.
follicles stout, oblique 3. CALOTROPIS.
follicles slender, straight 8. HETEROSTEMMA.
Stem twining. Corlobes overlapping.
Follicles stout, straight.
Corolla urceolate or campanulate.
Corona on the corolla-tube . 4. GYMNEMA.
Corona on the staminal column.
Cymes axillary; coronal scales
simple 6. MARSDENIA.
Cymes generally interpetiolar;
coronal scales notched . 7. Pergularia.
Corolla rotate; corona of spreading
scales 9. Dregea.
Follicles slender, straight 5. Gongronema.
Anthers without a membranous tip.
Leafy shrubs, more or less twining . 10. LEPTADENIA.
A leastless erect shrub 11. ORTHANTEERA.

1. Cryptolepis, R. Br.; G. P. n. 6.

1. **C. Buchanani,** Roem. & Sch.; Fl. Br. Ind. iv. 5; Brandis For. Flora 330, Ind. Trees 467; Gamble Man. Ind. Timb. 490. Vern. *Dúdhi*, *Medhá-singhi*, Dún; *Karántá*, Hind.

A large climbing shrub with milky juice. Leaves 3-6 by 1-2.5 in., oblong or elliptic, acute or acuminate, coriaceous, glabrous and shining above, glaucous beneath; nerves many, slender, nearly horizontal, terminating in intramarginal veins; base acute; petiole 3.-5 in. long. Flowers pale-white, in short peduncled lax dichotomous cymes. Calyx with 5 scales within, short, acute. Corolla 6-7 in. diam.; tube short, throat naked; lobes linear, twisted in bud. Corona of 5 fleshy clavate scales, included within the tube. Stamens free, included; filaments short, with a broad base; anthers sagittate, with a tuft of hairs at the back, tips acuminate, conniving. Stigma broadly conical. Follicles 2-4 by 5-7 in., in divaricate pairs, narrow-lanceolate, straight, somewhat compressed; seeds compressed, oblongovate, with a tuft of hairs at the hilum which are about 1 in. long.

Common in the SIWALIK DIVISION, and also met with up to 4,000 ft. in the HILLS, e.g., Binálgádh, Thadiár, etc.

The milk of this climber quickly coagulates into a substance resembling caoutchouc and may be used for repairing punctures in bicycle tires.

Fl. May, June. Fr. Cold season.

2. Periploca, Linn.; G. P.n. 26.

2. **P. calophylla**, Falc.; Fl. Br. Ind. iv. 12; Brandis For. Flora 330, Ind. Trees 467. Vern. *Párh*, Jaunsar.

A glabrous shrub with slender branches. Leaves about 3 by 5 in. or smaller, narrow-lanceolate, long-acuminate, coriaceous, shining; lateral nerves very numerous, parallel; petiole '2-'3 in. Flowers in lax cymes. Calyx glandular within; lobes ovate, obtuse. Corolla '3 in. diam., rotate, pinkish or pale-yellow; lobes ovate, longer than the tube, usually hairy on the upper surface, greenish below. Corona of 5 thick scales, connate into a 10-lobed ring, usually crowned with 5 filliform aristas. Stamens included, free; filaments short; anthers bearded at the back and cohering laterally; pollen granular. Stiyma convex. Follicles about 6 by '3 in., in divuricate pairs, cylindrical; seeds linear, '5-'7 in. long; coma over 1 in. long.

In shady ravines in the OUTER HIMALAYA, e.g., Sansárú Khálá. Also in the Tons Valley, e.g., Khúnigádh.

Fi. Apr., May. Fr. Cold season.

3. Calotropis, R. Br.; G. P. n. 51.

Erect shrubs with milky juice. Leaves usually subsessile; rather fleshy. Flowers in umbelliform cymes. Sepals glandular within. Corolla-tube broad-can panulate; lobes ovate, valvate. Corona of 5 compressed fleshy appendages, adnate to and radiating from the staminal column, spurred at the back. Anthers with a broad membranous tip, inflexed on the stigma; pollenmasses waxy, stipitate, pendulous. Stigma depressed, pentagonous. Follicles single, thick, straight on the ventral and convex on the dorsal side, very oblique and sharply incurved near the base; seeds with a silky coma.

Analysis of the Species.

Coronal scales truncate; flower-buds ovoid;

corolla-lobes spreading . . . 1. C. gigantea.
Coronal scales acute; flower-buds hemi-

spherical; corolla-lobes erect .

2. C. procera.

1. C. gigantea, R. Br.; Fl. Br. Ind. iv. 17; Brandis For. Flora 331, Ind. Trees 471; Gamble Man. Ind. Timb. 491. Vern. Madár, Safed Ak, Hind.

A middle-sized shrub; young parts covered with adpressed white tomentum; bark pale. Leaves subsessile, 4-8 by 1-4 in., obovate or oblong, acute or acuminate, coriaceous, cottony beneath; base cordate. Flowers downy outside, on long pedicels arranged in axillary or subterminal pedunculate simple or compound umbels or corymbs; buds ovoid. Corolla dull-purple or white, '5-1 in. diam.; lobes ovate-lanceolate, spreading. Corona-scales elongated but truncate at the apex, hairy. Follicles 3-4 in. long, recurved; seeds ovate, '25 in. long, with a bright silky-white coma.

Believed to be found in the Dún and possibly also in the Saháranpur District, but is certainly very rare in our area.

The hair of the seeds makes a good stuffing material for pillows and cushions and mixed with a small proportion of ordinary cotton may be spun into thread. The fibre of the stems is used for bow-strings, fishing-lines and nets. The wood is made into gunpowder charcoal in the Deccan. The acrid juice and the roots are used in country medicine.

Fl. and fr. throughout the year.

2. C. procera, R. Br.; Fl. Br. Ind. iv. 18; Brandis For. Flora 331, Ind. Trees 472, Gamble Man. Ind. Timb. 491. Vern. Ak, Madár, Hind.

Habit, leaves and inflorescence as of the preceding species, excepting that the leaves, 8-9 by 4 in., are more gradually narrowed and somewhat less cottony beneath when mature, and the peduncles rather longer. Flowers purplish-red, silvery outside, odorous; buds hemispherical. Corolla-lobes erect. Corona-scales acute, nearly as broad as long, glabrous or pubescent. Follicles as of the last species.

Economic uses, as of C. gigantea.

Common throughout the Sahábanpur and Dún Districts, generally in fallow lands and ráu-beds, e.g., Ránipur, Phándowála, etc. Also found in low valleys in the Hills, e.g., Binálgádh, Silgádh, etc.

Fl. and fr. throughout the year, but chiefly in the cold season.

C. Acia, Ham.; Fl. Br. Ind. iv. 18,—occurs in grass-lands about Lachiwála in the Dón. It is an herbaceous plant with petiolate leaves, otherwise closely resembling C. procera.

4. Gymnema, R. Br.; G. P. n. 101.

1. G. tingens, W. & A.; Fl. Br. Ind. iv. 31; Brandis Ind. Trees 469.

A large twining shrub, almost wholly glabrous, old stems covered with reticulating ridges of white cork. Leaves 4-6 by 2-3-5 in., ovate, often cordate, membranous, acuminate or caudate; petiole 1-1-7 in. long. Cymes 4-6 in., corymbosely racemose, peduncle shorter than the petioles; bracts oblong. Flowers 3 in. diam., pale-yellow. Sepale glabrate. Corolla-lobes broadly ovate or oblong, glabrous. Corona of double villous processes inside the corollatube and below the sinuses. Filaments connate into a short column; anther-tips small, membranous; pollen-masses one in each cell, waxy, stalked, erect. Stigma exserted. Follicles generally single 35-4-5 by 7-1-2 in., uniformly tapering and acute at both ends smooth and glabrous, slightly busked. Seeds comose.

Nakraunda and Káluwála in the Dún, not very common.

Fl. June-Aug. Fr. Nov.-Jan.

5. Gongronema, Dene.; G. P. n. 102.

1. G. nepalense, Done.; Fl. Br. Ind. iv. 33; Brandis Ind. Trees 471.

A large twining shrub; young shoots and inflorescence pubescent. Leaves 4-6 by 2-3·5 in., oblong elliptic or ovate, acuminate, membranous or subcoriaceous, glabrous above, puberulous along the nerves beneath; main lateral nerves about 8 pairs, arcuate, the lowest pair from near the base; base rounded, less frequently subcordate; petiole 8-1·7 in. long, rather slender. Peduncles 2-6 in. long, axillary, usually 1 to each pair of leaves, generally branching into 3 long divaricate umbel-bearing arms; pedicels 2-3 in., slender. Flowers; yellow, 25 in. across. Calyx small, 5-partite. Corolla campanulate; tube and lobes of about the same length, the latter ovate, slightly overlapping to the right. Coronal scales generally absent. Anthertips inflexed, concealing the stigma; pollen-masses solitary in each cell, waxy, erect. Stigma clavate or conical. Follicles 2-5-3 by '2-3 in., acuminate, thin-walled; seeds '3 in. long, linear; coma of very fine white silky hairs about 1 in. long.

Fairly common in the Dún;—Lachiwála, Ráipur, Bindál nálá, etc.

The strong fibre is used for the same purposes as that of Marstenia.

Fl. Aug., Sept. Fr. Sept., Oct.

6. Marsdenia, R. Br.; G. P. n. 108.

Twining shrubs. Leaves more or less membranous, often cordate. Flowers (in the species described below) in corymbosely branched compound cymes. Calyx 5-partite. Corolla usually campanulate, often with a brush of short hairs at the throat; lobes spreading, overlapping to the right. Coronal scales 5, erect, adnate to the back of the anthers. Anthers with an inflexed tip; pollen-masses waxy, stipitate, erect. Stigma truncate or beaked. Follicles usually in divaricate pairs, lanceolate; seeds comose.

Analysis of the Species.

Coronal scales far exceeding the anther-tips; leaves cordate, velvety; follicles transversely rugose, beaked

Coronal scales not exceeding the anther-tips; leaves cordately 2-lobed, glabrescent; follicles longitudinally wrinkled, not beaked 2. M. tenacissima.

1. M. Roylei, Wight; Fl. Br. Ind. iv. 35; Brandis For. Flora 333, Ind. Trees 470; Gamble Man. Ind. Timb. 492. Vern. Marua-bel (?), Dún; Khárchu, Jaunsar.

A twining shrub; young parts soft-tomentose. Leaves 3-6 by 2-4.5 in., ovate, acuminate, often velvety beneath; base usually deeply cordate; petiole 1.5-2 in. Cymes 1.1.5 in. diam., much smaller and fewer-flowered than in M. tenacissima. Flowers somewhat larger. Calyx hairy outside. Corolla-lobes 15-25 in. long, hirsute inside. Follicles 3 by 1.1.5 in., with a beak-like tip, transversely rugose; pericarp thick; seeds 5 in. long.

Outer slopes of the Himalaya; and also in Jaunsar and Tehri-Garhwal, up to 7,000 ft. Common at Mussoorie.

It yields a silky-white strong fibre which is used for fighinglines and similar other purposes.

Fl. May, June. Fr. Cold season.

2. **M. tenacissima**, W. & A.; Fl. Br. Ind. iv. 35; Brandis For. Flora 333, Ind. Trees 470; Gamble Man. Ind. Timb. 492 Vern. *Marua-bel*, Dún.

A large twining shrub; extremities soft-tomentose; bark grey, corky and deeply furrowed on old stems. Leaves 4-6 by 3-4 in., broad-ovate, cordately 2-lobed, acuminate, pubescent or tomentose when young; petiole 2-4 in. long. Flowers in corymbosely branched cymes. Corolla 2 in. diam.; lobes oblong, ciliate. Follicles 4-6 by 1-2 in.. lanceolate, finely pubescent, longitudinally wrinkled; pericarp very thick; seeds ovate-oblong, 5 in. long.

Occasionally in Khair forests of the Dún and along the foot of the Himalaya. Less frequently in Sál areas.

The bark of young shoots yields a silky-white fibre of great strength, used for fishing-lines by the Goorkhas and for bow-strings by the "Mountaineers of Rajmahal."—Sir D. Brandis. The coagulated milky juice can be used as India-rubber.

Fl. Apr., May. Fr. Cold season.

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7. Pergularia, Linn.; G. P. n. 110.

1. **P. pallida**, W. & A.; Fl. Br. Ind. iv. 38; Brandis For. Flora 334, Ind. Trees 470; Gamble Man. Ind. Timb. 493.

A large twining shrub with corky bark on old stems; young parts pubescent with soft curved hairs. Leaves 2-4 by 1'2-3 in., ovate, cordate, acute or acuminate, entire, rather membranous, tomentose or pubescent beneath until mature; lateral nerves up to 6 pairs; petiole '8-1'3 in. long. Cymes very often interpetiolar, umbelliform, hairy; peduncle up to '5 in. long; pedicels '3-'7 in. long, slender, much crowded. Flowers '5-'7 in. across, yellowishwhite, inodorous; buds oblong or oblanceolate. Calyx '15-'2 in. long, campanulate; segments subulate, ciliate at the edges. Corollatube as long as the calyx somewhat swollen at the base; lobes linear, '2-'4 in. long, overlapping to the right. Coronal scales adnate to the back of the anthers, erect, flattened, acute, membranous; pollenmasses erect, waxy. Follicles 3-4 by 1 in., lanceolate, longitudinally wrinkled; seeds '4 in. long, broad-ovate, concave, comose.

Not uncommon in the Dún, $e.\,g.$, at Karwápáni and Lachiwála. The fibre of young shoots may be found useful.

Fl. May-July. Fr. Sept.-Nov.

8. Heterostemma, W. & A.; G. P. n. 114.

1. **H. alatum,** Wight; Fl. Br. Ind. iv. 47; Brandis Ind. Trees 473.

A twining shrub; branches with two lines of grey hairs. Leaves 3-6 by 2-4 in., ovate elliptic or oblong, entire, acute or acuminate; nerves 3-4 pairs, winged beneath, the first two pairs subbasal; base rounded or cuneate; petiole 1-2 in. long. Flowers yellow; about '5 in. diam., ustally in racemose cymes; peduncles about '5 in. long, stout; pedicels '2-5 in. long, slender. Calyx small, 5-partite. Corolla rotate; lobes triangular, valvate. Corona of 5 large spreading horizontal lobes; pollen-masses minute, erect, waxy. Stigma truncate, 5-angled. Follicles double, divaricate through nearly three right angles and therefore pointing obliquely upward, 3-5 by '2-'3 in., straight, pointed; pericarp thin; seed about '5 in. long, darkbrown, membranous; coma about 1 in. long, brownish-white.

Low valleys in Jaunsar and Tehri-Garhwal, up to 5,000 ft.; rather scarce: Thadiár.—Mr. J. S. Gamble.

Fl. Rainy season. Ft. Cold season.

9. Dregea, E. Meyer; G. P. n. 117.

1. D. volubilis, Benth.; Fl. Br. Ind. iv. 46, Brandis Ind. Trees 468; Gamble Man. Ind. Timb. 493.

A stort twining shrub with a woody stem, and usually with rather stout and stiff branches; innovations generally hoary-tomentoge. Leaves 3-5 by 2-3.5 in., ovate, entire, acute or acuminate. rather coriaceous, usually tomentose beneath when young: main lateral nerves up to 5 pairs; base rounded truncate or cuneate. lem often cordate: petiole rather stout, '8-2 in. long. Cymes axillary or interpetiolar, umbelliform; peduncles 1-3 in. long, slender, drooping: pedicels '5-1'5 in., rusty-scaberulous. Flowers green, '3-'5 in. diam. Colyx about '1 in. across, stellate. Corolla dark-green, cup-shaped: lobes broadly triangular, overlapping to the right. Coronal scales 5. fleshy, hemispherical, adnate to the very short column, spreading, inner angle cuspidate; pollen-masses erect, waxy. Stigma domeshaped. Follicles usually double, 3-4 by 1-1.2 in., lanceolate. longitudinally ribbed, velvety until mature, afterwards minutely tomentose; seeds '3-'4 in. long, broad-elliptic, concave, shining, with sharp edges; come of very fine white silky hairs about 1.5 in. long.

Very common in Khair forests in the SIWALIK DIVISION, especially in the Jumna and Sông Valleys, up to 5,000 ft. Also in low valleys in Jaunsar, e.g., Kándá, 4,500 ft.

Fl. Apr.-June. Fr. Cold season.

10. Leptadenia, Br.; G. P. n. 125.

1. L. reticulata, Wight; Fl. Br. Ind. iv. 63, Brandis Ind. Trees 472; Gamble Man. Ind. Timb. 493.

A diffuse twining shrub with corky bark on old stems; young parts hoary. Leaves 2-3 by 1-1.5 in., ovate oblong or elliptic, acute, entire, coriaceous, pale, glaucous beneath; lateral nerves 6-8 pairs but very faint; base rounded cuneate or acute, scarcely cordate; petiole 3 13 in. Cymes axillary, umbelliform, 5-1 in. diam., many-flowered; peduncle 3-6 in. long, rather stout; pedicels of varying lengths, but never exceeding the peduncle. Flowers dirty-or brownishwhite, 2 in. diam. Calyx half the length of the flower; lobes acute or obtuse. Corolla rather fleshy; lobes pubescent, with margins folded inward, hooked andbearded at the tip, valvate in bud. Corona double—corolline of 5 scales between the corolla-lobes, staminal of an undulate wing at the base of the anthers. Stigma included, 5-angled. Follicles generally solitary by abortion, 2-3

by '5-'7 in., straight, turgid, very hard, smooth with a thick curved beak; seeds '5 in. long, narrow-ovoid, flat, winged, comose at the bilum.

Along the foot of the Saháranpur Siwalies: Khúrá. Barkálá, Ránipur, etc. Also grass lands near Mothronwála, Dehba Dún.

Fl. May-July. Fr. cold season.

11. Orthanthera, Wight; G. P. n. 125.

(United with Leptadenia in the "Gen. Plantarum.")

1. O. viminea, Wight; Fl. Br. Ind. iv. 64; Brandis For. Flora 335, Ind. Trees 472; Gamble Man. Ind. Timb. 493. Vern. Mahúr-ghás, Khip, Hind.

A small erect twiggy leafless green shrub. Flowers about 2 in. long, dirty-brown, in few-flowered woolly cymes; peduncles 2-1 in. long. Calyx parted nearly to the base; sepals lanceolate, without glands. Corolla salver-shaped; tube cylindrical; lobes oblong, valvate in bud. Corona double, corolline of minute scales alternating with the corolla-lobes, staminal an undulating ring below the anthers; anthers without a tip; pollen-masses stipitate, erect. Follicles solitary, 4-6 in. long, linear, compressed, erect; pericarp thin, brown inside; seeds 2 in. long, brown; coma of very fine silky hairs about 5 in. long.

Found in the ráu-beds of the Saháranpur Forests ; also in the Sông, Súswá and Ganges rivers in the Dún.

The flower-buds are eaten as a vegetable in Oudh, and rope is made of the fibre.

Fl. Feb.-May. Fr. Sept.-Nov.

Tylophora tenuis, Bl.; Fl. Br. Ind. iv. 42,—is a very graceful slender little twiner found in grass lands near Nakraunda in the Dún and towards Khárá in the Sahárandur District. Leaves rather fleshy, 1-15 in. long, ovate-elliptic or oblong, acute or apiculate; base rounded or cordate; nerves indistinct; petiole '1-3 in. long. Flowers small, dark-purple, few together on a simple or branched filliform peduncle; pedicels '3-'5 in. long. Pollen-masses subercet, waxy. Follicles 3 in. long, drooping; pericarp membranous. Fr. Oct.-Dec.—G. P. n. 103.

FAM. 55. LOGANIACEÆ; G. P. N. 108.

Trees, shruos or herbs. Leaves opposite, simple, with interpetiolar stipules or a raised transverse line at the internodes. Flowers regular, in simple or compound axillary or terminal cymes. Calyx small, 4-5-toothed. Corolla 4-5-partite, imbricate or valvate. Stamens epipetalous, alternating with the corolla-lobes. Ovary free, 2-celled; ovules one or many in each cell; style simple; stigma simple or 2-lobed. Fruit a berry or a capsule, 1-many-seeded; albumen copious.

Analysis of the Genera.

Erect shrubs. Cor. imbricate; fruit a capsule . 1. BUDDLEIA. Scandent shrubs. Cor. valvate; fruit a berry. 2. GARDNERIA.

1. Buddleia, Linn.; G. P. n. 14.

Trees, shrubs or herbs, usually mealy- or woolly-tomentose. Leaves united by a stipular line. Flowers tetramerous. Corolla-lobes imbricate in bud. Stamens 4; filaments very short. Style linear; ovules many in each cell; stigma obscurely 2-lobed. Capsule septicidally 2-valved; seeds small, many.

Analysis of the Species.

Flowers in interrupted panicles of heads; leaves broad and tomentose on both surfaces

1. B. paniculata.

Flowers in panicles of dense spikes; leaves narrow and glabrous above. . .

2. B. asiatica.

I. B. paniculata, Wall.; Fl. Br. Ind. iv. 81; Brandis For. Flora 318, Ind. Trees 475; Gamble Man. Ind. Timb. 495. Vern. Sendroi, Jaunsar.

An evergreen shrub with a crooked stem; bark thin, lightvery, peeling off in long strips; extremities rusty-tomentose. Leaves 4.6 by 2 in., variable from lanceolate to ovate-triangular, dentate crenate or sub-entire; petiole 5-1.5 in. Flowere fragrant, subsessile in pedunculate heads or clusters forming an irregular panicle. Calux '15-'2 in., urceolate, woolly outside; teeth short. Corolla pink and white, tomentose outside, tubular : lobes rounded, obtuse. Capsule ellipsoid, '2 in. long.

Fairly common in Jaunsar and Tehri-Garhwal, 4,000-7,500 ft., especially on exposed sunny slopes; e.g., Deoban, along the Lower

Chakrata road; Luhásu Block, Lambátách; etc.

Wood moderately hard and close-grained, weighing 41 lbs. per c. ft., but is used only as fuel. Likely to be useful in re-stocking bare hillsides.

Fl. Apr., May.

2. B. asiatica. Lour.; Fl. Br. Ind. iv. 82; Brandis For. Flora 318, Ind. Trees 475; Gamble Man. Ind. Timb. 495. Vern. Dúdhiá. Dún.

A large evergreen shrub; bark thin, grey; extremities densely clothed with soft grey tomentum. Leaves 4-6 by 1-1.2 in., lanceolate, serrulate, glabrous and dark-green above, densely grey- or white-tomentose beneath; petiole 2 in. or 0. Flowers odorous, sessile, in dense bracteate spikes arranged in large leafy terminal Calyx 15-2 in., campanulate; teeth triangular. panicles. Corolla-tube urceolate; lobes short, rounded, imbricate, at first white but fading into deep purple. Capsule 2-3 in. long, ellipsoid: valves bifid.

Common in ravines and grass lands in the SIWALIK DIVISION. and is often planted in gardens for ornament.

Wood tough and moderately hard. The branches would probably make good walking-sticks. Weight 44 lbs. per c. ft.

Fl. Mar., Apr.

Gardneria, Wall.; G. P. n. 30. 15

1. G. angustifola, Wall.; Fl. Br. Ind. iv. 93; Brandis Ind. Trees 477; Gamble Man. Ind. Timb. 499.

A large scandent glabrous shrub. Leaves opposite, 3-4 by 1 in., lanceolate, acuminate, entire, glabrous, rounded or acute at the base: petiole 2-3 long. Flowers about 5 in. across, solitary, on nodding filiform axillary peduncles 4-1 in. long. Calyx small, deeply 4-5-lobed. Corolly rotate; lobes 2 in. long, thick, valvate in bud. Stamens 4-5, on the corolla-tube; anthers subsessile; cells ovate, subconnate. Ovary 2-celled; ovule 1 in each cell; style cylindrical; stigma 2-lobed. Fruit a scarlet berry, '3 in. diam,

Found at Mussoorie and in the Bear Garden below Chakrata. Very scarce.

Fl. June, July.

Order 7.—POLEMONIALES.

FAM. 56. BORAGINACEÆ; G. P. N. 112.

Herbs, shrubs or trees. Leaves simple, alternate, rarely subopposite or opposite. Flowers in simple or compound usually-terminal cymes, rarely solitary or axillary. Calyx persistent; lobes usually 5, valvate in bud. Corolla hypogynous, gamopetalous, often with scales in the throat; segments as many as those of the calyx, generally imbricate in bud. Stamens epipetalous, alternating with the corolla-lobes. Ovary superior, of two carpels, entire or 4-lobed; cells usually 2-ovuled; style simple or forked, terminal or gynobasic (from between the lobes of the ovary). Fruit a drupe with 1-4 kernels, or separating into 2-4 nutlets; seeds erect or oblique.

Analysis of the Genera.

Style twice forked; fruit at least 5 i	in. diam.,		
usually 1 celled, 1-seeded .		1.	Cordia.
Style 2-fid; fruit up to 2 in. diam., wi	th 1-1		
kernels	_	2.	EHRETIA.

1. Cordia, Linn.; G. P. n. 1.

Trees or shrubs. Leaves alternate, rarely subopposite, petioled, usually coriaceous. Flowers often
polygamous, in terminal or leaf-opposed cymes. Calyx
4-5-toothed; teeth accrescent in fruit. Corolla funnelshaped; lobes 4-8 Stamens 4-8; filaments hairy.
Ovary entire, 4-celled. I ovule in each cell; style twice
bipartite, terminal. Drupe ovoid; endocarp hard,
usually 1-celled by abortion; albumen 0.

Analysis of the Species.

Leaves broad-ovate, glabrescent; calyx not ribbed
Leaves rotundate, scabrous above, tomentose beneath; calyx ribbed

2. C. vestita.

1. **C. Myxa,** Linn.; Fl. Br. Ind. iv. 136; Brandis For. Flora 336, Ind. Trees 478; Gamble Man. Ind. Timb. 500. Vern. Lassorá, Lassúrá, Lessorá, Hind.

A middle-sized deciduous tree, usually with a long bole; bark grey or brown, with shallow longitudinal wrinkles. Leaves variable, 3-6 by 2-4 in., broad-ovate, crenate or wavy at the margins, coriaceous, obscurely hairy beneath when young, from slightly scabrous to glabrous above; base rounded or cuneate; lateral nerves 4-6 pairs, the first pair sub-basal; petiole 5-2 in. Flowers white, polygamous, usually pentamerous, in loose ebracteate corymbose cymes. Calyx 1-15 in., irregularly toothed, not ribbed, accrescent in fruit. Corollalobes 1-12 in.; tube hairy within. Drupe yellow and glossy when ripe, usually 1-seeded, filled with a viscid sweetish pulp.

Common in the Dún and Saháranpur Forests, affecting shady ravines. Also Tons and other low Valleys in Jaunsar and Tehri-Garhwal.

Wood soft and porous, but seasons well and is fairly strong, used chiefly for fuel; weight 33 lbs. per c. ft. The fibre of the bark is made into ropes and is used to caulk boats. The fruit is eaten, both tender and ripe. The viscid pulp of the ripe fruit is used as bird-lime. The leaves are often used as plates.

Fl. Mar., Apr. Fr. May-July.

2. C. vestita, Hook. f. & Th.; Fl. Br. Ind. iv. 139; Brandis For. Flora 338, Ind. Trees 480; Gamble Man. Ind. Timb. 502. Vern. Barolá, Bairolá, E. Dún and Garhwal; Kúm, Saháranpur; Kúm-paiman, Hind.

A small deciduous tree with a low rounded crown; bark greenish-grey, smooth, exfoliating in large woody scales; young parts covered with grey pubescence. Leaves 3-6 by 2.5-5 in., broad-elliptic or orbicular, acuminate, coriaceous, scabrous above, tomentose beneath until mature; lateral nerves 3-5 pairs, the lowest sub-basal; base cuneate rounded or shallow-cordate; petiole 1-15 in. Flowers yellowish-white, polygamous, in dense compound cymes. Calyx 5 in. long, more or less ribbed outside. Corolla-lobes 3 in., ovate-oblong, spreading; tube as long as the lobes. Drupe 7 in. long, supported by the accrescent saucer-shaped calyx, and cuspidate with the remains of the style, filled inside with a gelatinous pulp.

Fairly common in the Saháranpur Siwaliks and only occasionally met with in the Dún, e.g. Tháno, Phándowála, Timli, Tirsál, etc. Also Kálsi.

Heartwood light-brown, beautifully mottled with darker veins, e.en.grained, hard, strong, tough and elastic, and is employed, where known, for whiel and well-work; weight 52-53 lbs. per c. ft. The pulp of the fruit is eaten.

Fl. and young leaves Mar., Apr. Fr. Oct., Nov.

2. Ehretia, Linn.; G. P. n. 6.

Trees or shrubs. Leaves alternate, entire or toothed. Flowers small, in axillary or terminal corymbs or panicles. Calyx deeply 5-partite. Corolla rotate; lobes 5, imbricate in bud. Stamens 5; anthers generally exserted. Ovary 2-celled; cells 2-ovuled; style terminal, bifid. Fruit a sub-globose drupe with 1-4 pyrenes; pyrenes solitary and 4-celled, or 2 and 2-celled, or 4 and 1-celled; cells 1-seeded; albumen scanty.

Analysis of the Species.

Leaves serrate; flowers in terminal panicles . 1. E. acuminata.

Leaves entire; flowers in terminal and axillary dichotomously compound corymbose cymes 2. E. lævis.

E. acuminata, R. Br.; Fl. Br. Ind. iv. 141; Brandis Ind. Trees 481; Gamble Man. Ind. Timb. 503. Syn.—E. serrata, Roxb.; Brandis For. Flora 339. Vern. Pandáyan, Dún; Púna. Jannsar and Hind.

A middle-sized tree nearly glabrous; large stems more or less fluted; bark brown, or when old mostly dark-grey, with longitudinal furrows or cracks. Leaves 4-8 by 1.5-3 in., elliptic-oblong, acuminate, shurply serrate, glabrescent and shining above, tough but rather thin; lateral nerves 8-10 on either side; petiole 5-1 in. Flowers numerous, white, fragrant, in large conical terminal panicles. Corolla-lobes 12 in., reflexed. Style bifd for less than half its length. Drupe 12-16 in. diam., with two 2-celled and 2-seeded pyrenes.

Fairly common in grass-lands in the Western Dún, and also found a Kálsi and lower valleys in Jaunsar up to 5,000 ft.: Rinálgádh. Silgádh. Thadiár, etc. Also at Káluwála, Nakraunda, Gulátappur, etc., in the E. Dún.

Wood light-brown, soft, light, fairly compact, easily worked; nsed for agricultural implements, scabbards, sword-hilts, etc.; weight 37 lbs. per c. ft. The fruit is eaten and the leaves are lopped for cattle-fodder.

Fl. Mar., Apr. Fr. Nov., Dec.

2. **E. lævis**, Roxb.; Fl. Br. Ind. iv. 141; Brandis For. Flora 340, Ind. Trees 481; Gamble Man. Ind. Timb. 503. Vern. Chamiōr, Hind.

A moderate-sized deciduous tree with an irregular-shaped trunk, and a spreading crown; bark smooth, mealy-grey outside, inner substance yellow, soft, not fibrous. Leaves 3-6 in. long, elliptic, obtuse or acuminate, entire, membranous while young, hard and fleshy when mature, glabrous or glabrescent, dark-green; nerves 6-10 on either side of the midrib; base cuneate, rarely rounded; petiole '5-1 in. Flowers white, small, in terminal or ax.ll ry dichotomously-branched corymbose cymes. Corolla-tube '1 in.; lobes '12 in., spreading. Drupe '2 in. diam., globose, depressed, 4-ribbed, with 1-4 one-seeded pyrenes.

Exceedingly common in the Dun and Saharanpur Forests, generally in damp shady places, e.g., Lachiwala Coppice, Kansrao Fass, etc. Also in the Amlawa and Tons Valleys in Jaunsar.

Wood tough and fairly durable, and is sometimes used for agricultural implements, but in this part of the country chiefly as fuel; weight 33-38 lbs. per c. ft. "The leaves are given as cattle-folder."—Sir D. Brandis.

Fl. Mar., Apr. Fr. Cold season.

FAM. 57. CONVOLVULACEÆ; G. P. N. 113.

Herbs or shrubs, usually twining, often with milky juice. Leaves alternate, simple, exstipulate. Flowers regular, bisexual, pentamerous, often showy. Calyx persistent, deeply 5-lobed; lobes imbricate, sometimes enlarged in fruit. Corolla campanulate or funnel-shaped often 5-plaited in bud. Stamens 5; anthers oblong Ovary superior, 2-carpelled and 2-celled, or by false dissepiments 4-celled; ovules 2 in each carpel. Style 1,

rarely 2; stigma 2-lobed or branched. Fruit indehiscent, often breaking up irregularly; albumen 0 or scanty; cotyledons generally plaited (0 in Cuscuta).

A Family of very little forest interest.

1. Porana, Burm.; G. P. n. 17.

1. **P. paniculata,** Roxb.; Fl. Br. Ind. iv. 222; Brandis For. Flora 342, Ind. Trees 487; Gamble Man. Ind. Timb. 507. Vern. Bel Kámú, Safed-bel, Saháranpur.

A large twining shrub; branchlets, inflorescence and underside of leaves clothed with grey pubescence. Leaves very variable in size, 2-5 by 1-5-3 in. (those running into the inflorescence much smaller), ovate-cordate, acuminate, entire, membranous, pubescent, with 5-7 basal nerves; petiole 1-5 in. long. Flowers very numerous, small, white, in large axillary and terminal leaf-bearing panicles. Sepals in flowers 1 in. long, linear-oblong, at least 3 enlarged in fruit into ovate-oblong membranous strongly reticulate shortly-stalked wings, 6-9 in. long, with a prominent midrib. Corolla 2 in. long; limb 5-plaited. Filaments short. Ovary 2-celled, 4-ovuled; style short; stigma obscurely 2-lobed. Capsule 2 in. diam., globose, hairy, membranous, fragile, 1-seeded by abortion; seed glabrous.

Very common in the Dún and Saháranpur Forests, generally in scrub jungles.

This climber is largely used in the Saháranpur District for making into baskets, and is generally preferred to all other plants used for the same purpose. The baskets used in removing earth while the Ganges Canal was being excavated are said to have been chiefly made of this climber.

Fl. Oct.-Jan. Fr. Mar., Apr.

Several plants of this Family are cultivated for their showy flowers, notably the following:—

- 1. Rivea ornata, Chois.; Fl. Br. Ind. iv. 183.—A climber with large white flowers about 2 in. across.—G. P. n. 2.
- 2. Argyreia Roxburghii, Chois.; Fl. Br. Ind. iv. 185.—Flowers large, purple or rose.—G. P. n. 3.

3. Ipomæa bona-nox, Linn.; Fl. Br. Ind. iv. 197.—Flowers large, white, with greenish plaits.—G. P. n. 9.

The following indigenous plants deserve notice:-

- 1. Lettsomin Thomsoni, Clarke; Fl. Br. Ind. iv. 193.—is found on the dry bare hill-slopes above Moindrot, 3,000 ft., also in the SIWALIKS, 2,500 ft. Flowers rose-purple, May-Cot.—G. P. n. 7.
- 2. Cuscuta reflexa, Roxb.; Fl. Br. Ind. 225. The Dodder. Vern. Akás-bel, Hind.; Sarag-báli, Jaunsar; - is the well-known leafless greenish-white or vellow flowering parasite very common in the scrub forests along the outer foot of the Siwaliks and in similar localities in the Dun, chiefly affecting all species of Zizyphus and also Adhatoda Vasica. The leafless character is carried even to the embryo which is destitute of cotyledons. The seed germinates on the ground, but the plant does not seem to derive much nourish. ment from it, its growth being sustained, for the little while it is obliged to shift for itself, by the fleshy albumen in which the germplant is imbedded in the seed. As soon as the seedling twines itself round a woody plant, it developes several thick sucker-like haustoria along the surface of contact, which, penetrating the bark of the host, begin to draw nourishment from the cambium-layer. Directly this is effected, it loses its attachment to the soil, and the portion of it below the lowest haustorium then dries and drops off. Henceforth the parasite goes on flourishing entirely at the expense of the host. It is used in veterinary practice for poultice on sprains. Fl. Sept.-Feb. G. P. n. 32. Fr. Feb.-Apr.

FAM. 58. SOLANACEÆ; G. P. N. 114.

Herbs or shrubs, rarely soft-wooded small trees. Leaves alternate, exstipulate. Flowers solitary or in clusters or cymes, axillary extra-axillary or terminal, regular, bisexual, usually pentamerous. Calyx inferior, free, usually persistent, sometimes enlarged in fruit. Corolla gamopetalous, rotate or campanulate, often plaited; limb 5- or more-lobed or entire. Stamens 5, epipetalous. Ovary superior, usually 2-celled; ovules

many, on peltate placentas; style simple. Fruit a many-seeded berry or capsule; seeds generally compressed.

This Family is of no special forest interest, although plants of considerable economic importance, such as the potato, brinjal, chillie (Capsicum), tomato (Lycopersicum), tobacco (Nicotiana), and Capegooseberry (Physalis) belong to it. Some are poisonous, e.g., Datura, while others are valuable in medicine.

1. Solanum, Linn.; G. P. n. 2.

1. **S. verbascifolium,** Linn.; Fl. Br. Ind. iv. 230; Gamble Man. Ind. Timb. 508. Brandis Ind. Trees 489. Vern. Ban Tamákú, Dún; Asedú, Garhwal.

A tall soft-wooded shrub, unarmed; bark light-grey; extremities and inflorescene stellate-woolly. Leaves alternate or falsely subopposite, 7-9 by 3-5 in., elliptic, acute at both ends or often rounded at the base, entire, subcoriaceous, stellately woolly, giving a fetid smell when bruised; petiole 1-2 in. Flowers in very woolly dichotomous cymes. Calyx-lobes enlarged in, but much shorter than, the fruit. Corolla '7 in. diam., white, woolly outside; limb plaited in bud. Stamens 5, on the corolla-throat; anthers apicular and joined into a cone round the style, opening by terminal pores. Ovary usually 2-celled. Berry '3-'5 in. diam., yellow when ripe.

Fairly common in moist shady places in the Dún (e.g., banks of the Song river), and in hedges round villages.

Wood very light, yellow, very soft, scarcely used even as fuel. The leaves and fruit are used in country medicine.

Fl. and fr. almost throughout the year.

- S. indicum, Linn.; Fl. Br. Ind. iv. 234. Vern. Bhút-katáiá Hind.— is a common weed of waste lands, prickly all over, with blue flowers and yellow berries, the latter '3-'5 in. diam. The fruit, leaves and roots are used in Hindu medicine.
- S. Melongena, Linn.; Fl. Br. Ind. iv. 235. Vern. Bhattá. Báigan, Báingan, Hind. The Brinjal. Much cultivated throughout India, up to 3,000 ft.
- S. tuberosum, Linn.; Fl. Br. Ind. iv. 229.—is the Potato, Vern. Alú, Hind., which is extensively cultivated throughout Upper India, up to 9,000 ft.

Order 8—PERSO NALES.

FAM. 59. BIGNONIACEÆ; G. P. N. 120.

Usually trees, sometimes woody climbers, rarely herbs. Leaves usually opposite, pinnately compound, sometimes undivided; stipules none. Flowers bisexual, irregular, showy, generally in terminal panicles or racemes. Calyx free, 2-5-lobed, truncate or spathaceous; lobes valvate in bud. Corolla often 2-lipped; lobes 5, unequal, imbricate in bud. Stamens epipetalous, usually 4 and didynamous,—the fifth wholly absent or rudimentary, or rarely fertile and then nearly equalling the others. Ovary superior, free, 2-celled, more or less stipitate and supported by an annular disk; ovules numerous; style filiform; stigma 2-lobed. Fruit an elongated 2-valved capsule; seeds winged, exalbuminous.

Analysis of the Genera.

Perfect stamens 5; capsule flat, septicidally

. 1. OROXYLUM.

2-valved; seeds discoid.

Perfect stamens 4; capsule terete, loculici-

dally 2-valved; seeds wedge-shaped . 2. STEREOSPERMUM.

1. Oroxylum, Vent.; G. P. n. 21.

O. indicum, Vent.; Fl. Br.. Ind. iv. 378; Gamble Man. Ind. Timb. 510; Brandis Ind. Trees 496. Syn.—Calosanthes indica, Bl.; Brandis For. Flora :47. Yern. Tarlú, Dún; Pharrái, Pharnát, E. Dún; Tantiá, Garhwal.

A small tree with few branches and a small open crown; bark soft, light brownish-grey and corky outside. Leaves opposite, 3-pinnate near the base, 2-pinnate about the middle, and simply pinnate towards the apex, 4-6 ft. long; pinnæ 3-4 pairs; 2-3 lower pairs bipinnate at the base, the pinnules being 3-5 foliolate. Ultimate leaflets 3-5 by 2-3 5 in., broad-ovate, acuminate, entire, glabrous. Flowers large, fleshy, in lax terminal-racemes; peduncle 2-3 ft.,

pedicels 1-1'5 in. long. Calyx 1 by '6 in., leathery, thimble-shaped. Corolla campanulate; tube green outside; limb 2-3 in. across; lobes 5, dark-red. Stamens 5, all fertile and nearly equal. Capsule septicidally 2-valved; shortly stipitate, 18-30 by 2'5-3'5 in., scabbard-like; seeds surrounded by a broad transparent white papery wing, 2-2'5 in. across, including the wing.

Fairly common in the Dún and Saháranpur Forests, and on the Outer Himalayan slopes up to 4,000 ft.

Wood yellowish-white, open-grained, very light and soft, sourcely used except for fuel. Weight 30 lbs. per c. ft.

"The bark and fruit are used in tanning and dyeing, and the seeds are used to line hats, and, placed between two layers of wickerwork to make umbrellas. Root, bark, leaves, and seeds are used in native medicine."—Sir D. Brandis.

Leafless Mar., Apr. Fl. June, July. Fr. Cold season.

2. Stereospermum, Chamisso; G. P. n. 37.

1. S. suaveolens, DC.; Fl. Br. Ind. iv. 382; Brandis For. Flora 351, Ind. Trees 495; Gamble Man. Ind. Timb. 515. Vern. Pádal. Hind.

A large deciduous tree, young parts viscous hairy; bark grey, exfoliating in large flat scales. Leaves opposite, 12-24 in. long, imparipinnate. Leaflets 5-9, more commonly 7, 3-6 by 2-3-5 in., broadefliptic, acute or acuminate, sharply serrate on young, entire on old trees, coriaceous, scabrous or velvety-tomentose; lateral nerves 6-8 pairs; petiolules about '1 in. Flowers dark-purple, pubescent, fragrant, in viscid trichotomous panicles. Calyx '2-'3 in., campanulate, shortly 3-5-lobed. Corolla 1-1'5 in. long, very soft; tube cylindrical, throat hairy; limb oblique, 2-labiate; lobes rounded, with curled edges. Stamens 4, didynamous, with a rudimentary fifth. Disk fleshy, annular. Capsule loculicidally 2-valved, 15-24 by '6-'8 in., obscurely 4-ribbed, dark-grey with elevated white specks; dissepiment cylindrical, brown, corky; seeds 1'5 by '3 in. including the two oblong wings which are lateral and set somewhat obliquely like those of an electric fan.

Fairly common in the Dun and Sanáranpur Forests, especially in Sál areas, with a tendency to become somewhat gregarious on clayey soils.

Sapwood white, fairly hard. Heartwood small, yellowishbrown, mottled with darker streaks, very hard, seasons and polishes well, and is fairly durable; weight 40-50 lbs. per c. ft. Sir D. Brandis says it is "much valued for building and generally commands a ready sale"; but it does not seem to be much cared for in the SIWALIK DIVISION. It yields excellent charcoal, and the root and bark are used in Hindu medicine.

New leaves and fl. May, June. Fr. Cold season, but remaining long on the tree.

- 1. Millingtonia hortensis, Linn.; Fl. Br. Ind. iv. 377. The Indian Cork-tree, Vern. Akás Ním, Hind.—is a handsome tall tree, with fragrant white flowers, cultivated in avenues and gardens in Dehra and most places in the plains.—G. P. n. 20.
- 2. Amphicome emodi, Lindl.; Fl. Br. Ind. iv. 385;—is an herbaceous plant found in the crevices of limestone rocks in JAUNSAR, e.g., Mátkángrá, and along the pipe-line between Chakrata and Deoban. Leaves alternate, imparipinnate; leaflets about 1 in. Flowers bright rose, about 2 in. long. Capsule terete, about 9 in. long.—G. P. n. 42.

FAM. 60. ACANTHACEÆ; G. P. n. 122.

Herbs or shrubs, rarely trees, usually with swollen joints. Leaves opposite, simple, exstipulate. Flowers with large persistent bracts and bracteoles. Calyx 5-partite. Corolla 2-lipped, or subequally 5-lobed; lobes imbricate or twisted in bud. Stamens 4 or 2, inserted on the corolla-tube. Disk often conspicuous. Ovary superior, 2-celled; ovules anatropous, 1 or more in each cell; style filiform, sometimes bifid. Fruit a loculicidal capsule, often elastically dehiscent. Seeds exalbuminous, ovoid or compressed, usually hard, seated on up-curved horny processes of the placenta, often clothed with white elastic hairs which are best seen when wetted.

Analysis of the Genera.

Corolla-lobes subequal, twisted to the left in bud; fertile stamens usually 4. Capsule 6-8-seeded, seeds discoid Capsule 2-4-seeded, seeds much compressed Corolla 2-lipped, lobes imbricate in bud; fertile stamens 2.	
Corolla tubular, slightly lipped; capsule 12-14-seeded . Corolla broad-campanulate, deeply lipped; capsule 4-seeded	3. Phlogacanthus. 4. Adhatoda.

1. Æchmanthera, Nees; G. P. n. 38.

1. Æ. tomentosa, Nees; Fl. Br. Ind. iv. 428; Brandis Ind. Trees 504; Gamble Man. Ind. Timb. 518.

A small shrub. Leaves 3-5 by 2 in., broad-lanceolate, acuminate, slightly crenate, coarsely pubescent; base rounded; petiole 1-1.5 in. Flowers in clusters of 3-8, arranged in axillary and terminal trichotomously-branched panicles. Bracts 5 in. long; bracteoles narrow. Sepals 5 in. long, linear, usually viscous. Corolla purple, 1 in. long, tubular-ventricose, nearly straight, suddenly widening near the middle; segments rounded, twisted in bud. Stamens 4, didynamous; anthers obtuse. Capsules 3-5 in. long, narrow-oblong, 8-seeded. Seeds apparently glabrous, but are seen covered with white weak hairs when wetted.

Top of the Siwaliks and Outer Himalayan slopes 3,5,000 ft.: Málköt, above Rájpur, etc. Also in inner valleys in Jaunsar and Tehri-Garhwal, e.g., Dhárágádh, Lunágádh, etc.

Fl. Dec. and Jan. at intervals of 5 (?) years when the plant dies in the same way as some Strobilanthes. It thus died over a large area in the Lúnágádh Valley in Tehri-Garhwal in the spring of 1900.

Var. Wallichii, Nees; Vern. Bair-ra, Bharárá, Málköt;—has stems covered with dense snow-white wool, and leaves with silky tomentum which is of a delicate purple colour, at least when young. It flowers gregariously after 4 or 5 years and dies as soon as the seeds are mature. Outer slopes of the Himalaya: Málköt Forest. Also Ámláwa Valley in Jaunsar and in the Siwaliks, e.g., behind Sháhjahánpur, and in the Timli and Mohand Passes.

2. Strobilanthes, Bl.; G. P. n. 59.

Small shrubs or herbs. Leaves frequently unequal, toothed or subentire, often with raphides. Flowers in axillary or terminal spikes or panicles. Bracts deciduous or persistent; bracteoles small or 0. Calyx usually deeply 5- fid, segments narrow, equal or unequal. Corolla tubular-ventricose, curved or straight; lobes 5, subequal, twisted in bud. Stamens 4 and didynamous, or 2. Capsule 4-2-seeded. Seeds compressed, hairy or glabrous; hairs, if present, elastic when wetted.

Analysis of the Species.

Fls. in spikes; (lvs. never quite glabrous.) Spikes with scale-like imbricate bracts; leaves sessile, auriculate 1. S. auriculatus. Spikes without imbricate bracts. Spikes 1-sided; leaves elliptic, the upper cordate. Sepals linear, glabrous; corolla 6. S. Wallichii. nearly straight Sepals obtuse, hairy; corolla much curved 7. S. atropurpureus. Spikes symmetrical; leaves elliptic, none ever cordate . . . 5. S. angustifrons. Spikes panicled; leaves ovate, with usually a cordate or rounded base. 4. S. alatus. Flowers in pedunculate heads (leaves narrowed at both ends). Leaves glabrous; calyx pubescent . 2. S. pentstemonoides. Leaves hairy; calyx generally glabrous . 3. S. Dalhousianus.

 S. auriculatus, Nees; Fl. Br. Ind. iv. 453; Brandis Ind. Trees 500; Gamble Man. Ind. Timb. 519.

A small shrub; branches quadrangular, often zigzag. Leaves variable and often very unequal in the same pair, from 10 by 2.25 in. to 3 by 1.5 in., sessile, auriculate, serrulate, sparsely hairy above. Spikes 3.4 by 5 in., mostly terminal, solitary. Bracts broader than long, 2.3 in. long, persistent, with aromatic glandular hairs. Calyx

velvety; segments '2-'3 in., unequal. Corolla 1 in., bluish-purple, curved; tube short, narrow; limb slightly 2-lipped. Capsule glabrous, 4-seeded, '3 in. long; seeds elastically hairy.

Throughout the Dún and on the OUTER HIMALAYAN slopes up to 4,000 ft. Very common at Lachiwála.

Fl. Nov.-Mar.

- 2. S. pentstemonoides, T. Anders.; Fl. Br. Ind. iv. 460; Gamble Man. Ind. Timb. 519.
- A much-branched glabrous shrub. Leaves 5-8 by 1.5-2.5 in., elliptic, acuminate at both ends, closely serrate; nerves 7 pairs; base decurrent into the petiole; petiole 5-2 in. Flowers in buds in globose heads enclosed in white concave bracts 25-15 in. long, usually 3 heads to a peduncle. Catyx pubescent; lobes linear, 2-3 in. long. Corolla 1.5 in. long, curved, pale-purple. Caspute 7 in., clavate, 4-seeded; seeds ovate, silky, 1 in. long.

Banks of the Ré-nadi in the Dún; OUTER HIMALAYAN VALLEYS, e.g., Mussoorie, and probably up to 6,000 ft. in Jaunsab.

Fl. Rainy season.

3. S. Dalhousianus, Clarke; Fl. Br. Ind. iv. 460, Brandis Ind. Trees 501; Gamble Man. Ind. Timb. 519.

A suberect shrub, 2-3 ft. high; stems hairy. Leaves 4-6 by 1·3-2 in., elliptic, acuminate, hairy; petiole ·5-1·5 in. long. Bracts as in the last species but shorter than the heads. Calyx usually glabrous, subscarious; lobes linear-oblong. Corolla-tube yellow, 1-1·5 in. long, somewhat narrowed at the neck; limb oblique, purple; lobes rounded, emarginate, one much larger than the others. Capsule ·5-6 in. long, 4-seeded.

HILLS, 6,-8,000 ft. Fairly common.

Fl. Rainy season.

4. S. alatus, Nees; Fl. Br. Ind. iv. 464; Brandis Ind. Trees 501; Gamble Man. Ind. Timb. 519. Vern. Mashnoi, Lálor, Jaunsar.

A small shrub; branches quadrangular. Leaves 4-6 by 2-3 in., ovate, acute or acuminate, crenate or serrate; nerves 7-9 pairs of which 4-5 pairs are crowded near the base; base cordate or rounded; petiole 1-3 in., often slightly winged; upper leaves sessile

Spikes forming terminal panicles. Bracts caducous. Sepals 3-4 in, ligulate, unequal. Corolla about 1 in long, purple, campanulately ventricose, curved beyond the calyx, with 2 hairy lines within. Capsule narrow, 75 in long, elliptic, hairy, 4-seeded; seeds ovate, hairy, 3 in long.

JAUNSAR and TEHRI-GABHWAL, above 6,000 ft.: Deoban, Konáin, Mundáli; Deotá.

- Fl. Rainy season.
- 5. S. angustifrons, Clarke; Fl. Br. Ind. iv. 466.

A small shrub with terete branches; old stems glabrous, young parts inflorescence and leaves white-tomentose. Leaves 3-4 by 1·5·2 in., elliptic, acuminate at both ends, glabrescent, pale beneath; nerves 6 pairs; petiole 5·7 in.; upper leaves never codate. Spikes terminating in small heads and forming short irregular panicles. Bracteoles 1 in., linear. Calyx linear, 3-5 in. long, pubescent. Corolla about 1 in. long, purple, nearly glabrous, narrow; mouth curved. Capsule 3-5 in. long, 4-seeded; seeds hairy, 1 in. long.

Common in the Dún and on the Outer Himalayan slopes, up to 6,000 ft.: Lachiwála, Rájpur; Málköt.

Fl. Jan.-Mar.

6. **S. Wallichii**, Nees; Fl. Br. Ind. iv. 471; Brandis Ind. Trees 500; Gamble Man. Ind. Timb. 519. Vern. Jánú, or Zánú, Jaunsar.

A small shrub with quadrangular stems; upper portion herbaceous and renewed every year. Leaves 3.5 by 1.2 in., elliptic, acuminate, glabrescent, crenate-serrate; nerves 6-8 pairs; base acute, petiole 1-1.5 in.; upper leaves sessile, cordate. Spikes 1-6 in., one-sided. Flowers blue, usually in pairs. Bracts gradually smaller, persistent. Sepals ligulate, '3 in. long., often with glandular hairs. Corolla 1-1.5 in. long, nearly straight, very gradually ventricose; segments round. Capsule linear, '5-7 in. long; seeds 4, '1 in. long, snborbicular, brown-pubescent.

JAUNSAR and TEHBI-GARHWAL, 7-10,000 ft. : very common.

This plant is remarkable for its gregarious and exclusive habit, and is a pest in places where reproduction of tree species is needed. Its upper portion is herbaceous, and grows and dies every year, adding only one internode to the stumpy lower portion which thus goes on growing until there are about 12 internodes. It then flowers, and dies as soon as the seeds are mature. It is known to have

flowered in Jaunsar in 1882, 1894 and 1906, giving a cycle of 12 years. On the second occasion, the seeds did not germinate until March 1896, but by the end of May all old Strobilanthes areas were seen thickly covered with a young crop of seedlings of its own and also of a species of Impatiens, which usurped the soil when the Strobilanthes had died. Being an annual, the former, however, was gradually ousted by the latter.

The leaves and young shoots are greedily browsed by sheep and goats.

- Fl. Rainy season at intervals of 12 years. Fr. Sept., Oct.
- 7. S. atropurpureus, Nees; Fl. Br. Ind. iv. 472; Brandis Ind. Trees 501; Gamble Man. Ind. Timb. 519.

A perennial shrub often growing in swamps; stem 1-1.5 ft. high, succulent. Leaves 2.5-4 by 1-2 in., ovate, acuminate, crenate-serrate, the upper cuneate, petioled or decurrent to the base, very membranous. Spikes lax; flowers solitary or paired; lower bracts leaf-like. Sepals linear, subobtuse, hairy. Corolla 1.5-2 in. long, much curved, blue; ventricle very broad. Capsule about 1 in. long; seeds 2 in. long.

Fairly common in damp localities in the HILLS.

Fl. Aug.-Oct.

- 3. Phlogacanthus, Nees; G. P. n. 70.
- 1. **P. thyrsiflorus**, Nees; Fl. Br. Ind. iv. 512; Gamble Man. Ind. Timb. 523; Brandis Ind. Trees 501.

An evergreen shrub up to 8 ft. high; bark smooth, grey; branches 4-angled. Leaves 6-8 by 1·5-3 in., lanceolate or oblance-olate, tapering at both ends, subentire, glabrous, deep glossy-green, densely punctulate; petiole '7-1 in. Inforescence a thyrsoid terminal panicle up to 12 in. long. Bracts 2 in., linear. Calyx deeply 5-fid; tube '1 in. long; segments '2-'3 in. long, bristle-like, pubescent. Corolla tubular, orange to brick-red, villous; tube '7-1'2 in. long, curved upwards; upper lip sub-erect. Fertile stamens 2. Capsule 1-1'2 by '1 in., 4-cornered, glabrous, 12-14-seeded; seeds compressed, covered with elastic hairs.

Common in the Dún, on the OUTER HIMALAYAN slopes up to 4,000 ft., and also in ravines in the Saháranpur Siwaliks, e.g., Bádsháhibágh, Dholkhand and Ráni ráus. Always in shady moist localities.

Often cultivated in gardens for its flower and deep-green glossy foliage.

Fl. Feb.-Apr. Fr. Apr.-June.

4. Adhatoda, Nees; G. P. n. 98.

1. **A. Vasica**, Nees; Fl. Br. Ind. iv. 540; Gamble **Man.** Ind. Timb. 523; Brandis Ind. Trees 498. Vern. Bánsá, Dún; Arúsá, Hind.; Vásiká, Sans.

An evergreen and gregarious shrub with a fetid smell. Leaves 4-8 by 1.5-3 in., lanceolate or elliptic, acute at both ends, minutely pubescent especially when young; lateral nerves 8-12 pairs; petiole 1-1.5 in. Inflorescence a dense short-pedunculate bracteate spike, 2-4 in. long. Bracts 7 by 5 in., ovate or obovate, sessile; bracteoles, 7 by 2 in. Calyx 3-5 in. long, deeply 5-lobed; lobes equal, lanceolate. Corolla-tube 3-5 in. broad, white, lower portion short and barrel-shaped; lower lip with two lines of oblique purple bars. Stamens 2; filaments dilated; anther-cells acute at the apex, scarcely spurred at the base. Capsule 7 in., clavate, longitudinally channelled, pubescent, 4-seeded; seeds 2 in. long, glabrous, tubercled.

Exceedingly common in the SIWALIK DIVISION and also found in JAUNSAR in valleys up to 4,000 ft.,—generally in moist or shady localities, and everywhere remarkably gregarious.

The leaves are considered valuable in Hindu medicine as a specific for cough and asthma. They are mixed with manure in the Punjab, presumably to keep off injurious insects. The flowers are used as a medicine for asthma and ophthalmia. The wood is white, moderately hard and very even-grained. It is used for gunpowder charcoal, and is turned into beads in Bengal. Every part of the plant is exceedingly bitter. Horses seem to be fond of the leaves.

Fl. Dec.-Apr. Fr. Feb.-May.

Among other plants of this large and widely diffused Family, the following deserve mention:—

1. Petalidium barlerioides, Nees; Fl. Br. Ind. iv. 416;—is an undershrub, but occasionally fairly tall. Leaves 2-4 in. long, acuminate, crenate, grey-pubescent. Flowers subsessile, solitary or crowded, 1 in. long, yellowish-white. Stamens 4, didynamous

Capsule '5 in. long, compressed. Not uncommon along the banks of the Jumná, e.g., near Ambári. Fl. Mar.-Mæy.—G. P. n. 19.

- 2. Dædalacanthus nervosus, T. Anders,; Fl. Br. Ind. iv. 418.—Leaves often 8 by 4 in., ovate acuminate, obscurely crenulate, glabrous. Flowers 1.5 in. long, blue, glabrous, in compound bracteate spikes; corolla-tube long and narrow; stamens 2. Common in the Eastern Dún and elsewhere, up to 3,000 ft. Fl. Feb., Mar.—G. P. n. 23.
- 3. Barleria cristata, Linn.; Fl. Br. Ind. iv. 488. A diffuse undershrub, yellow-hairy. Leaves 3-4 by 1 in., elliptic, entire, yellow-hairy beneath. Flowers 1.5 in. long, purple-blue or white. Sepals in 2 pairs, outer pair much the larger, toothed, spinescent. Fl. cold season. Common in shady places up to 3,000 ft.—G. P. n. 84.
- 4. Barleria strigosa, Willd.; Fl. Br. Ind. iv. 489.—Leaves larger than those of the preceding species, ovate, acute, long-decurrent. Flowers 1.5-2 in. long, blue; outer sepals 1 in., nervose, obscurely mucronate-serrulate. Fl. Cold season. Fairly common in the Dún.

Order 9-LAMIALES.

FAM. 61. VERBENACEÆ; G. P. N. 125.

Herbs, shrubs or trees, with quadrangular stems. Leaves opposite or whorled, simple or digitate, very rarely pinnate; stipules none. Flowers irregular, rarely regular, usually bisexual, in bracteate simple or panicled cymes. Calyx 5-4-toothed, persistent, often enlarged in fruit, sometimes coloured. Corolla gamopetalous, more or less oblique, 2-lipped or subequally 4-5-lobed. Stamens usually 4, rarely more or fewer, didynamous or rarely equal. Ovary superior, 2-carpellary, 2-4-celled, with usually 1 ovule in each cell; style terminal; stigma usually 2-lobed. Fruit a dry or fleshy drupe with 1-4 one-seeded pyrenes or a 1-4-celled endocarp, rarely a 4-seeded capsule; seeds exalbuminous.

Analysis of the Genera.

Corolla regular, stamens equal; Calyx not accrescent; drupe with 4 one-celled pyrenes Calyx much accrescent; drupe with	1. Callicabpa.
a 4-celled endocarp	2. TECTONA.
Corolla 2-lipped, 5- or 4-lobed; stamens	
didynamous.	****
Drupe with I pyrene.	·V··
Leaves simple.	
	3. PREMNA.
	4. GMELINA.
Leaves digitate (flowers less than 5	
inch)	5. VITEX.
Drupe with 4 pyrenes; leaves simple.	
Drupe succulent; calyx usually co-	
loured and enlarged in fruit .	6. CLEBODENDRON.
Drupe dry; calyx not enlarged in fruit.	
Calyx broadly salver-shaped, scarcely	
lobed, coloured	7. Holmskioldia.
Calyx small turbinate, deeply 5-lobed,	
not coloured	8. CARYOPTERIS.

1. Callicarpa, Linn.; G. P. n. 37.

1. **C. macrophylla,** Vahl; Fl. Br. Ind. iv. 568; Brandis For. Flora 368, Brandis Ind. Trees 512; Gamble Man. Ind. Timb. 525. Vern. Daiá, Dún and Garhwal.

A shrub with straggling branches; extremities thickly woolly-tomentose. Leaves 6-10 in. long, ovate or ovate-lanceolate, acuminate, closely crenate, glabrescent above, thickly cottony-tomentose beneath; lateral norvos 12-15 pairs; petiole 3-5 in. § Inflarescence a dense-flowered globose axillary compound cyme. Flowers small, pale rose-coloured. Calux 05 in., minutely 4-lobed. Corolla tubular, regular, 4-lobed, about 1 in. long. Stamens 4, equal; anthers small, exserted. Ovary 4-celled. Drupe white, with 4 one-celled pyrenes, spongy-succulent outside when fully ripe.

Swampy localities in the Dun, e.g., Nakraunda, Misirwala, Kaluwala, Khairi, and ravines along the base of the Himalaya.

Wood soft. The heated leaves are applied as a remedy or relief in rheumatism by villagers.

Fl. Rainy season. Fr. Cold season.

2. Tectona, Linn. f.; G. P. n. 40.

1. **T. grandis,** Linn. f.; Fl. Br. Ind. iv. 570; Brandis For. Flora 354, Ind. Trees 505; Gamble Man. Ind. Timb. 526. The Teak. Vern. Sáigún, Hind.

A large deciduous tree often fluted near the base; bark thin, fibrous, light-brown or grey, peeling off in long thin strips; branchlets quadrangular and deeply channelled, with a large white pith. Leaves opposite, simple, 12-24 by 10-12 in., gradually becoming smaller and bract-like in the inflorescence, ovate elliptic or obovate. acute or bluntly acuminate, rounded or shortly cuneate and sometimes decurrent at the base, entire, thickly coriaceous, glabrescent and rough above, stellately soft-tomentose beneath; lateral nerves 8-12 pairs, compound; secondary nerves transverse; petiole 1.5-2.5 in. long, stout, flattened above, sometimes narrowly margined. Inflorescence a large dicho- or trichotomously branched cymebearing bracteate terminal panicle 2-3 ft. long. Flowers regular, bracteolate, sweet-scented. Calyx 6-lobed, stellate-pubescent. globose in bud, salver-shaped and '15 in. across in open flowers, much accrescent globose membranous and about 1 by 8 in. in fruit. Corolla rotate, generally 6-lobed, slightly pubescent; tube very short, Stamens 6, inserted on the mouth of the corolla-tube: filaments 1.15 in. long, white. Ovary densely hairy; style slightly exceeding the stamens. Drupe 5-6 in. diam., globose, covered with a dense felt of branched hairs and enveloped by the inflated and loosely fitting enlarged calyx; endocarp very hard, 4-celled. Seeds 1-4. obovoid.

Indigenous in Central and Southern India and in Burma. Cultivated in Dehra Dún and Saháranpur, but young plants suffer much from frost in these parts.

Wood moderately hard, strongly scented, dark golden-yellow when freshly cut, turning dark-brown afterwards; annual rings distinct; medullary rays moderately broad, fairly numerous; weight 35 to 50 lbs. per c. ft. Taken all round teak is by far the best timber in India and perhaps also in the world, being capable of use for almost all conceivable purposes. It is in great demand for ship-building and railway-cars throughout the world, and consequently has a much larger export trade than any other Indian timber. An oil is extracted from the wood, which, rubbed on inferior timbers, increases their durability. The leaves are used for thatching and also for wrapping up parcels.

Leafless Dec.-Apr. Fl. Aug., Sept. Fr. Cold season, but remaining long on the tree.

3. Premna, Linn.; G. P. n. 42.

Trees or shrubs. Leaves opposite, simple, entire or toothed. Cymes terminal, panicled or corymbose; bracts small. Flowers often polygamous, greenish- or yellowish-white. Calyx 2-lipped or campanulately truncate or 2-5-toothed, often enlarged in fruit. Corolla short, tubular; limb 2-lipped. Stamens 4, more or less didynamous. Ovary 2- or 4-celled, 4-ovuled. Drupe small, globose or ovoid, supported by the persistent calyx; endocarp undivided, 1-4 celled, 1-4-seeded.

Analysis of the Species.

Leaves short-petioled; calyx 5-toothed, much enlarged in fruit. 1. P. latifolia. Leaves long-petioled; calyx-4-toothed, not enlarged in fruit. 2. P. barbata.

1. **P. latifolia**, Roxb.; Fl. Br. Ind. iv. 577; Brandis For. Flora 266, Ind. trees 511; Gamble Man. Ind. Timb. 536. Vern. Bakár, Dún; Bakárchá, Garhwal.

A small tree with greyish-white bark. Leaves 3.5 by 2.3 in., ovate, cuneate or rounded, less frequently shallowly cordate and then slightly docurrent at the base, acuminate, undulate, usually entire, softly pubescent, ashy-grey beneath; lateral nerves 7 pairs; petiole ·3·8 in. Corymb villous. Calyx ·08 in., in fruit up to ·2 in. Corolla about ·15 in., throat hairy. Drupe ·16 in., globose, black when dry.

Var. mucronata. Roxb.—differs from the type in having leaves with a cuneate base and longer acumen, corymbs rather flat-topped, and drupes more verrucose. It attains a considerable size in damp localities.

The type is not found in the region of this Flora, but the variety is fairly common in the outskirts of Sál forests in the Dún, and also in the scrub forests of the Saháranpur District, and low valleys in the Hills: Phándowála, Lachiwála, Ambári; Ránipur; Bámsu Depôt, etc.

Wood moderately hard, light-purple or pink when freshly cut, considered a good fuel and is used to obtain fire by friction; weight 38-43 lbs. per c. ft.

Leafless Feb.-Apr. Fl. Apr.-June. Fr. Cold season.

2. P. barbata, Wall.; Fl. Br. Ind., iv. 579; Brandis For. Flora. 367, Ind. trees 511; Gamble Man. Ind. Timb. 535; Vern. Bakár. Dún; Bakárchá, Garhwal.

A small tree with grey bark. Leaves 5-6 by 2.5-3.5 in., oblong or ovate, acuminate, rounded or subcordate at the base, usually distinctly but very distantly toothed above the middle, softly pubescent when young, afterwards glabrescent; lateral nerves 6 pairs; petiole 1-2 in. long. Corymbs 1-2.5 in. diam., glabrate in fruit. Corolla '1-'2 in. long, 2-lipped, hairy in the throat. Drupe '2 in., globose, obscurely verrucose.

OUTER HIMALAYA, up to 5,000 ft.: Jharipáni, Rájpur, Kálsi, etc. Also in the Siwalik Tract, e.g., Timli Pass.

Fl. Apr., May. Fr. Cold season.

P. herbacea, Roxb.; Fl. Br. Ind. iv. 581, is a small inconspicuous undershrub, produced annually from woody rootstocks after the jungle fires. Leaves sessile, 4 by 2-3 in., cuneate or obovate, serrate-pubescent. Flowers greenish-white, 4-lobed. Drupe '25 in. diam., globose. Grass-lands in the Dún, e.g., Sabháwála.

4. Gmelina, Linn.; G. P. n. 45.

1. G. arborea, Linn.; Fl. Br. Ind. iv. 581; Brandis For. Flora. 364, Ind. Trees 509; Gamble Man. Ind. Timb. 537. Vern. Gambár, Gumbár, Gambhár, Kumbár, Khambár, Hind.

A middle-sized or large deciduous tree; bark grey or grevishbrown, smooth, exfoliating in scurfy flakes; branchlets with white pecks. Leaves 4-8 by 3-6 in., broad-ovate, cordate with a shortlycuneate glandular base, acute or acuminate, entire, finely tomentose and glaucous beneath; lateral nerves 6-10 pairs, straight, the lowest pair sub-basal and penuiveined with 4-6 strong secondary nerves on either side: intermediate nerves straight, transverse with the main nerves; petiole 3-6 in., obscurely channelled above. (The leaves somewhat resemble those of Trewia nudiflora, Linn., which, however, are glabrous and have 5 arcuate basal nerves, besides other differences.) Inflorescence a terminal panicle with opposite decussate eymose branches. Calyx 2 in. Corolla 1-1.5 in. long, 2-lipped oblique, brownish-yellow, densely soft-tomentose outside; lobes 5 or 4. Stamens 4, didynamous. Ovary 4-celled, 4-ovuled; style slender, unequally bifid. Drupe ovoid or oblong, 7-1 in. long; periearp leathery, shining, yellow outside when ripe; endocarp bony. embedded in an aromatic sweetish pulp; seeds usually 1 to 3. lenticular, 2-3 in. long.

Occasional in mixed forests in the Dűn, in shady localities in those of Saháranpur, and in the Lower Hills and up to 4,000 ft. in valleys in the Himalayas.

Wood yellowish- or greyish-white, close- and even-grained, soft, light, but strong and durable, does not warp or split, and takes a fine glossy polish; weight 30-40 lbs. per c. ft.; no distinct heartwood. It is excellent for carpentry, but is little used in the Dún. Valued for posts and boat-making in ASSAM and for drums in the CENTRAL PROVINCES. The fruit, root and bark are used in Hindu medicine, the former being also edible.

Fls. with new leaves in Mar., Apr. Fr. May, June.

5. Vitex, Linn.; G. P. n. 46.

1. V. Negundo, Linn.; Fl. Br. Ind. iv. 583; Brandis For. Flora. 369, Ind. Trees 503; Gamble Man. Ind. Timb. 539. Vern. Shimálú, Sumálú, Chhátimal, Nishinda, Dún; Sonái, Jaunsar; Mallá, Saháranpur.

A deciduous shrub with thin grey bark and spreading branches. Leaves 3-5-foliolate (simple and more distinctly crenate on luxuriant young shoots), with a raised line across the stem at the base of the petioles. Leafle's lanceolate, 1-5 by 3-1-3 in., the lowest pair smallest, sessile or subsessile, the middle pair, if present, more or less distinctly petiolulate, the odd leaflet largest and with a petiolule 3-6 in. long, entire or distantly crenate above the middle, glabrescent above, grey-pubescent beneath. Panicles up to 12 in. long. Calyx 1-15 in., 5-toothed. Corolla 2-5 in., bluish or purplish-white; limb spreading, 2-lipped, 5-lobed, middle lobe of the lower lip the largest. Stamens 4, didynamous, exserted. Ovary 2-4-celled, 4-ovuled; style filiform, shortly 2-lobed. Fruit a succulent drupe supported by the more or less accrescent calyx, 15-25 in. diam., globose, black when ripe; endocarp normally 4-celled.

Common throughout the SIWALIK DIVISION, and planted in hedge-rows in villages. Also in valleys in the Hills.

The roots and leaves are used in Hindu medicine, and the branches and twigs for basket-making.

Fl. June-Aug. Fr. Cold season.

There seem to be two distinct forms of this species,—one as described above, and the other a somewhat smaller shrub, with leaves more generally crenate, and panicles, flowers and drupes generally much smaller.

This latter flowers later, and is perhaps more common about DRHMA. Is this ver. incisa, Lam.?

6. Clerodendron, Linn.; G. P. n. 49.

Shrubs or small trees, rarely herbs. Leaves simple, opposite or whorled. Calyx 5-toothed or lobed, usually enlarged in fruit and coloured. Corolla-tube slender; limb spreading, 2-lipped or more or less obliquely 5-lobed. Stamens 4, often long-exserted. Ovary 4-celled, with 1 ovule in each cell; style filiform, bifid at the apex. Fruit a dry or succulent drupe, often lobed.

Analysis of the Species.

Corolla-tube less than 1 in. long.	
Leaves subsessile, narrow	1. C. serratum.
Leaves long-petioled, broad	2. C. infortunatum.
Corolla-tube 3-4 in. long (leaves subsessile	•
	3. C. Siphonanthus.

1. C. serratum, Spreng.; Fl. Br. Ind. iv. 592; Brandis For. Flora 364, Ind. Trees 508; Gamble Man. Ind. Timb. 543. Vern. Banlákri. Jaunsar.

A shrub with annual shoots from a thick woody rootstock. Leaves opposite or in whorls of 3, 4.8 by 1.5.2.5 in., oblong ellipticoblong or oblanceolate, serrate, smooth, puberulous or glabrate; base cuneate; petiole 0.2 in. long. Flowers bluish-white, in terminal panicles; bracts 5-1.5, obovate or lanceolate, often coloured; pedicels 0.25 in. Calyx cup-shaped, 2 in. long, shortly 5-lobed. Corolla-tube 3.5 in. long, narrow-cylindrical, slightly constricted at the neck; hairy within; mouth oblique, 2-lipped; lobes 3.5 in., oblong. Stamens hairy at the base. Drupe 3 in. diam., black; pyrenes up to 4.

Tehri-Garhwal, 3,-5,000 ft., generally on grassy hill-sides and fire-traces: Thadiar, Bamsu, Molta, Sendra, etc.

Fl. May-Aug. Fr. Sept.-Nov.

2. C. infortunatum, Gærtn.; Fl. Br. Ind. iv. 594; Brandis For. Flora 363, Ind. Trees 507; Gamble Man. Ind. Timb. 543. Vern. Karú, Dún; Bhant, Hind.

A deciduous shrub up to 12ft. high; bark with large grey raised corky lenticels; every part of the plant very bitter and with a fetid smell. Leaves opposite, 4-9 by 3-6 in., broad-ovate, acuminate, sometimes slightly cordate, entire or obscurely denticulate,

roughly hairy above, tomentose or thinly hairy beneath; petiole 1-6 in. Panicles terminal, hairy; branches and calyx reddening in fruit. Calyx deeply 5-cleft; lobes lanceolate, 3-4 in. in flower but 8-1 in. deep-red and leathery in fruit. Corolla white, tinged with red; tube cylindrical 7-9 in. long; lobes elliptic, acute, 3-5 in. long. Stamens exceeding the corolla-lobes. Drupe fleshy, somewhat tetragonal, rather depressed, bluish-black when ripe, enclosed in the accrescent leathery calyx.

Very common as an undershrub in Sal areas in the SIWALIK DIVISION, where the leaf-canopy is not open enough for grass.

The bitter leaves and bark are used in country medicine.

Fl. Jan.-Apr. Fr. Rainy season.

3. C. Siphonanthus, Br.; Fl. Br. Ind. iv. 595; Brandis For. Flora 364, Ind. Trees 508; Gamble Man. Ind. Timb. 543. Vern. Chingári, Dún.

A shrub 4-8 ft. high, with herbaceous fluted hollow stems, Leaves in whorls of 3-5, 6-9 by 1-1.5 in., narrow-lanceolate, subentire, glabrous, rather hard; petiole 0-2 in. Flowers white fading into yellow, in rigid terminal panicles 9-18 in. long; pedicels 5-1.5 in. long, dark-ed and enlarged in fruit; segments oblong, acute. Corolla-tube 3-4 by 2 in., drooping; lobes 5-7 in. long, opovate-oblong. Drupe ovoid, dark-blue, about 5 in. long, supported by the spreading red calyx.

Fairly common in grass-lands in the Dtn: R aipur, Lachiwala Ramgarh, Dehra, etc. Often cultivated in gardens for its flower.

Sections of the hollow stem are tied round the neck in BENGAL as a charm against various ailments,

Fl. July, Aug. Fr. Cold season.

7. Holmskioldia, Retz.; G. P. n. 50.

1. **H. sanguinea**, Retz.; Fl. Br. Ind. iv. 596; Brandis For. Flora 370, Ind. Trees 506; Gamble Man. Ind. Timb. 544. Vern. Rithoul, E. Dún; Kápni, Hind.

A large straggling shrub. Leaves opposite, 3-4 by 2-3 in., ovate, acuminate, generally crenate, pubescent; main lateral nerves about 6 pairs; base truncately cuneate; petiole 5-1·2 in. long. Calyx '7-1 in. across, salver-shaped, membranous, red-orange, entire or with a wavy margin. Corolla-tube 6-1 in.long, cylindrical, curved, bright-red; limb unequally 5-lobed. Stamens 4, didynamous; filaments glabrous; anthers exserted. Ovary 4-celled, 4-ovuicd;

style shortly bifid, glabrous. Drupe 2.3 in. long, obovoid, deeply 4-lobed at the apex; seeds 1.4, oblong.

Outer slopes and foot of the HIMALAYA and shady ravinee in the Dún: Tháno, Kálimatti, Ráipur, etc.; also passes in the Dún side of the SIWALIKS. Cultivated in gardens at Dehra.

Fl. Oct.-Dec.

8. Caryopteris, Bunge; G. P. n. 52.

Spreading shrubs; extremities pubescent or tomentose. Leaves opposite, simple, acuminate, minutely gland-dotted. Cymes small, dense, axillary or running into a terminal thyrsus; bracts small. Flowers lightmauve, generally pubescent. Calyx 5-fid; segments somewhat accrescent in fruit. Corolla-tube short; limb spreading, 2-lipped, middle lobe of the lower lip largest, much crisped. Stamens 4, didynamous; anthers exserted. Ovary 4-celled, 4-ovuled; style filiform, usually much exserted, shortly bifid. Eruit a small globose capsule; valves 4, induplicate, 1-seeded; seeds oblong, erect.

Analysis of the Species.

Cymes mostly in terminal thyrsus; calyx-segments in fruit lanceolate, erect, ribbed . C. Wallechiana. Cymes mostly axillary and corymbose; calyx-segments in fruit triangular, spreading, not ribbed . 2. C. grata.

1. C. Wallichiana, Schauer; Fl. Br. Ind. iv. 597; Brandis For. Flora 370, Ind. Trees 512; Gamble Man. Ind. Timb. 544. Vern. Chingári, Karui, Dún.

A large shrub with quadrangular branches; bark peeling off in long papery strips; young shoots grey-pubescent. Leaves up to 4 by 1.5 in., narrow-elliptic or lanceolate, acuminate, toothed or nearly entire, puberulous; base cuneate; petiole 3.5 in. Flowers sweet-scented, light-mauve, in dense axillary cymes forming thyrsus at the ends of the branches. Calyx deeply 5-lobed; lobes in fruit creet, lanceolate, ribbed. Corolla-tube 2.3 in. long; lobes elightly

larger than the tube, the lower middle one bluish, others white. Style more than twice the length of the corolla. Fruit 2 in. long. globose, densely pubescent.

Common in ravines and on waste lands in the Dun and Lower HILLS: up to Saiá in Jaunsar.

Fl. Mar., Apr. Fr. May, June.

2. C. grata, Benth.; Fl. Br. Ind. iv. 597. Brandis Ind. Trees 512: Gamble Man, Ind. Timb. 544.

A rambling shrub: branches brown-pubescent. Leaves 3-5 by 1-1.8 in., those near the cymes much smaller, elliptic, acuminate. erenate-serrate or subentire, pubescent; lateral nerves about 8 pairs in the larger leaves; base rhomboid or almost rounded; peticle 3.6 in. Cymes mostly axillary, densely rusty-pubescent, dichotomously corymbose, few-flowered. Calyx membranous, pubescent. triangular in fruit, not ribbed. Corolla about 3 in. long, faintly bluish, pubescent, glandular. Style about twice the length of the corolla. Capsule 15-2 in. diam., globose, slightly ribbed, nearly glabrous.

JAUNSAR and TEHRI-GARHWAL, up to 5,000 ft.- Jharipáni below Mussoorie, Sáinji; Chátrágádh, Khúnigádh, etc.

Fl. Jan. Apr. Fr. May-July.

The following plants belonging to this Family deserve notice :--

- 1. Lantana Camara, Linn.: Fl. Br. Ind. iv. 562:—is a small weedy shrub with recurved prickles on the branches, apparently wild and found in hedges in Dehba. Leaves opposite, simple, up to 3 in. long, rugose. Flowers about '5 in. long, sweet-scented, in peduncled capitate spikes which are 1-1.5 in. diam. Corolla-tube pink or red; lobes orange or yellow. Drupe purple when ripe. Fl. Rainy season. -G. P. n. 18.
- 2. Lantana indica, Roxb.; Fl. Br. Ind. iv. 562; -is very similar in appearance and found in the same places, but has no recurved prickles, and the flowers are smaller and not so strongly scented. Corolla pink, red, yellow or white. Fl. Rainy season.
- 3. Verbena bonariensis, Linn.; Fl. Br. Ind. iv. 565; is another weed which is a native of Brazil, but is found near Mothronwala in the Dún. Leaves sessile, 3-4 by 5-6 in., nervose, serrate. Flower-spikes in terminal corymbs. Fl. Aug., Sept .-G. P. n. 26.

FAM. 62. LABIATÆ; G. P. N. 126.

Herbs, rarely shrubs, usually with aromatic oilglands; stem quadrangular. Leaves opposite or whorled; stipules none. Flowers irregular, in whorls which are either simple, or in simple or panicled spikes. Calyx persistent, sometimes enlarged in fruit, 4-5-lobed or 2lipped. Corolla 4-5-lobed or 2-lipped; lobes imbricate in bud. Stamens 4, didynamous, the upper pair sometimes imperfect. Disk prominent. Ovary 4-lobed, 4celled; ovules solitary in each cell, erect; style gynobasic, simple; stigma usually 2-fid. Fruit of 4 usually. dry 1-seeded nutlets included in the persistent calvx.

A family of very little forest importance in India, but containing many herbaceous plants of value for food, medicine, perfume,

Analysis of the Genera.

Whorls of flowers in terminal panicled spikes; calvx not reticulate.

Calvx-teeth long, feathery in fruit; nutlets

. 1. COLEBROOKIA.

hairy .
Calyx-teeth short, naked; nutlets shining,
2. Elsholtzia.

Whorls of flowers simple, axillary; calyx

strongly reticulate; nutlets smooth . 3. ROYLEA.

1. Colebrookia, Smith: G. P. n. 25.

1. C. oppositifolia, Smith; Fl. Br. Ind. iv. 642; Brandis Ind. Trees 515; Gamble Man. Ind. Timb. 547. Vern. Bindá, Bindú, Dún and Garhwal; Lúlri, Bambher, Jaunsar; Kálá Bánsá, Bintálakri, Saháranpur.

A hoary shrub, under favourable circumstances up to 20 ft. high, with grey bark. Leaves opposite, 4-10 by 1.5-3 in., oblongelliptic, acuminate, crenate, softly tomentose; lateral nerves 12-15 pairs, arcuate; petiole 5-1 in., stout, white-felted. Spikes 2-4 in. long, in many-branched panicles, very numerous, hoary in fruit. Flowers about 1 in. long, in congested clusters at varying distances on the rachis. Calyx very small, villous; tube much grooved; lobes elongated and feathery in fruit. Corolla while; lobes rounded. Stamens 4, usually exserted; anther-lobes round. Style 2-fid; lobes subulate. Nutlets usually only one, hairy, obovoid.

Common along ravines and raus in the SIWALIK DIVISION; also in low valleys in JAUNSAR and the OUTER HIMALAYA, up to 4,500 ft. 1 Silgadh, Binalgadh; Sansarú-Khala; Badshahibagh, etc.

The wood weighs 46 lbs. per c. ft. It is used for gunpowder charcoal. The leaves are applied on wounds and sores.

Fl. Jan., Feb. The fruit-spikes remain long on the plants, almost throughout the year.

2. Elsholtzia, Willd.; G. P. n. 27.

1. E. polystachya, Benth.; Fl. Br. Ind. iv. 643; Brandis Ind. Trees 516; Gamble Man. Ind. Timb. 547. Vern. Pathoi, Pothá, Jaunsar.

A shrub up to 8 ft. in height, with grey fibrous bark which peels off in long strips. Leaves opposite, 3-6 in. long, elliptic-lanceolate, acuminate, serrate or crenate, pubescent, subsessile or minutely petioled. Flowers minute, spicate. Spikes 4-10 in. long, flowering 3 in. diam., narrower in fruit, strongly aromatic. Fruiting calyx tubular, ribbed, 'l in. long; teeth 5, erect, triangular. Corolla white, pubescent; limb 4-fid. Stamens 4, exserted, divergent. Style subequally 2-fid. Nutlets oblong.

Fairly common in Jaunsan and Tehri-Garhwal, up to 9,500 ft.. associated with *Indigoferas* in open grassy slopes.

Fl. Aug.-Oct. Fr. Cold season, but remains long on the plant.

3. Roylea, Wall.; G. P. n. 110.

1. R. elegans, Wall.; Fl. Br. Ind. iv. 679; Brandis Ind. Trees 515; Gamble Man. Ind. Timb. 548. Vern. Karánoi,

Jaunsar ; Titpáti, Garhwal.

A woody undershrub with grey bark. Leaves opposite, 1-2 in. long, ovate, crenately toothed, tomentose beneath; petiole about 2 in. long. Flowers in 6-10-flowered axillary whorls. Calyx 5-lobed, 10-ribbed, rigid. Fruiting calyx 5-7 in. long; lobes as long as the tube. Corolla 5 in., white with a touch of pink, 2-lipped; upper lip erect, lower spreading; tube narrow. Stamen; 4, ascending. Stigma subequally 2-lipped. Nutlets 1 in. long, obovoid-oblong, smooth.

OUTER HIMALAYA, JAUNSAR and TERRI-GARAWAL, up to 5,000

ft.: Málköt, Rájpur; Saiá, Dhárágádh; Thadiár, etc.

The leaves, which are extremely bitter, are used as a febrifuge by the Jaunsaris.

Fl. Mar., Apr. Fr. Apr., May.

The Túlsi plant (Ocimum sanctum, Linn.), the Common Mint. Vern. Pudiná, Hind. (Mentha sativa, Linn.), and Peppermint (M. piperito, Linn.) belong to this Family. They are cultivated in gardens in Saháranpur and the Dún, and also found wild, probably as escapes, e.g., Pudiná at Sahansra-dhárá, and Túlsi at Rikhikesh and hasúmri.

The following plants also deserve mention:-

- 1. Plectranthus rugosus, Wall., Fl. Br. Ind. iv. 620; Vern. Chichli, Jaunsar;—is a small shrub very common on bare hill-sides throughout the Hills, about 4,7,000 ft. e.g., Bámsu, Dhárágádh, the Sacred Forest at Köti, etc. Leaves 5-1 in. long, ovate, crenate, rugose. Flowers bluish or purplish-white.—G. P. n. 11.
- 2. Plectranthus ternifolius, Don, Fl. Br. Ind. iv. 621;—is a rigid shrub 5-6 ft. high, found at Karwápáni, Lachiwála, etc., in the Dűn, also at Nonai in Tehri-Garhwal (Mr. J. S. Gamble). Leares 4-6 by 1-1-3 in., lanceolate, densely tomentose; regularly serrate; petiole 1-2 in. Flowers white outside, sessile, in dense long white villous panicles.
- 3. Pogostemon plectranthoides, Desf.; Fl. Br. Ind. iv. 632;—is a gregarious bush having a strong mint-like smell; stems dark purple, with a large pith. Leaves 3.7 by 1.5-3 in., ovate, acuminate, doubly serrate, membranous, pubescent; lateral nerves very arching; petiole 1.3 in. long. Flowers white or pink, in large terminal panicled bracteate spikes. Common in shady ravines in the Dún, e.g., Kánsráo, Tháno, etc. The smell of the bruised leaves is said to cure ague. Fl. Rainy season.—G. P. n. 23.
- 4. Pogostemon parviflorus, Benth.; Fl. Br. Ind. iv. 632; closely resembles the above, but is usually a smaller plant, less hairy, with stems darker purple, and spikes shorter and more densely flowered. Common in ravines up to 4,000 ft. in the Hills. The leaves are chowed and poulticed on snake-bites.—Fl. Cold season.
- 5. Meriandra strobilifera, Benth.; Fl. Br. Ind. iv. 652; occurs in dry rocky places about Dúngri (6,-7,000 ft.) in JAUNSAR. Leaves 3-4 in. long, oblong, coriaceous, very rugose, usually with a sagittate base. Spikes with woody bracts in fruit.—G. P. n. 67.

APETALÆ.

Order 1.—CHENOPODIALES.

FAM. 63. AMARANTACEÆ; G. P. N. 130.

Herbs, rarely shrubs. Leaves generally alternate, exstipulate. Flowers small, occasionally unisexual, in spikes cymes or clusters, supported by scarious bracts and a pair of bracteoles. Sepals 5, scarious, persistent. Petals 0. Stamens 1-5, opposite the sepals. Ovary 1-celled. Fruit usually a utricle, rarely a berry or a capsule. Seed orbicular or ovate, compressed; testa crustaceous.

A weedy Family, not of much forest interest.

Analysis of the Genera.

Rambling shrubs; seeds few or many . . 1. Deebing 1A. Erect shrubs; seed solitary . . . 2. Bosia.

1. Deeringia, Br.; G. P. n. 1.

1. **D. celosioides,** Br.; Fl. Br. Ind. iv. 714; Brandis Ind. Trees 518; Gamble Man. Ind. Timb. 550. Vern. *Chûndri*, Dún; *Latman*, Hind.

A small shrub, very conspicuous when in fruit. Leaves alternate, up to 4 in. long, ovate or ovate-lanceolate, gradually diminishing in size towards the ends of the branches; base more or less rounded; petiole 2-1 in. Spikes 6-12 in. long, terminal, panicled. Flowers 2 in. diam., greenish-white, very shortly pedicellate. Sepals oblong, spreading in fruit. Stamens 4-5. Fruit a berry, 2 in. diam., lobed, scarlet and filled with a frothy pink juice when ripe.

Common in hedges and scrub-forests in the Dun. Young shoots and leaves are good for fodder, and are said to encourage the flow of milk in milch cows. The juice of the ripe fruit is used as a substitute for red ink.

Fl. Sept., Oct. Fr. Dec., Jan.

2. Bosia, Linn.; G. P. n. 7.

1. **B. Amherstiana**, Hook f.; Fl. Br. Ind. iv. 7:6; Brandis Ind. Trees 518; Gamble Man. Ind. Timb. 550. Vern. Bhengoi, Jaunsar.

A glabrous straggling shrub. Leaves alternate, 3-6 by 1-3 in., ovate, acute or acuminate, glabrous; base more or less acute; petiole ·2·7 in. long. Spikes both axillary and terminal, never exceeding the leaves. Flowers ·2 in. diam., 5-merous, green, in compound racemes or spikes. Sepals concave. Bracts and bracteoles green, with white margins. Stamens 5. Stigmas sessile. Fruit a berry, ·15 in. diam., globose, orimson when ripe; seeds with a crustaceous testa.

Fairly common in the Tons Valley and other hot valleys in Jaunsar.

The leaves dry black, and a black dye is obtained from them. The young shoots are eaten fried in ghee. The ripe berries are also eaten. Wood soft, very porous.

Fl. Apr., July. Fr. July, Oct.

Order 2.-PIPERALES.

FAM. 64. PIPERACEÆ; G. P. N. 139,

Aromatic herbs or shrubs, generally prostrate, Leaves alternate, simple, opposite or whorled, entire, often punctate, stipulate or exstipulate. Flowers in congested catkin-like spikes, supported by peltate bracts. Perianth 0. Fruit small; seeds with copious mealy albumen. Embryo minute.

This is a Family of no forest interest in North-Western India, but deserves mention as comprising such plants as *Piper longum*, Linn., Vern. *Pipûl*, and *P. Betle*, Linn., the well-known *Pân*. The tollowing species are found in this part of the country:—

l. Houttuynia cordata, Thunb.; Fl. Br. Ind. v. 78.—A small plant with a creeping rootstock. Leaves broadly ovate, cordate; stipules membranous. Bracts over '5 in. long, petaloid. Occasionally met with in hot damp localities in Jaunsar and Tehri-Garhwar, e.g., Dhármigádh, Khánigádh, etc. Fl. Apr.-June.—G.P. n. 3.

2. Piper brachystachyum, Wall.; Fl. Br. Ind. v. 87.—A glabrous twiggy shrub with somewhat woody branches. Leaves 3.7 by 1.3.5 in., thin, elliptic- or ovate-lanceolate, 5-nerved; base acute; petiole '2-5 in. Fruiting spikes globose or slightly oblong, leafpopt sel; peduncles never exceeding the spikes. Fruit '1 in. diam. Found in damp localities, e.g., banks of the Ré-nadi, Dehra I fn, and Pámsu Valley in Tehri-Garhwall.—G. P. n. 5.

Order 3.—DAPHNALES.

FAM. 65. LAURACEÆ; G. P. N. 143.

Trees or shrubs, more or less aromatic. Leaves usually alternate, simple, exstipulate, generally entire, gland-dotted. Flowers 1-2-sexual, regular. Perianth inferior, 6-4-cleft; segments imbricate in bud; tube sometimes enlarged in fruit. Stamens up to 12, in 2-4 series, usually half or more wanting or reduced to staminodes; filaments flattened and often with 2 glands at the base; anthers 2-4-celled, cells opening by upcurved deciduous valves. Ovary superior, 1-celled; ovule solitary, pendulous. Fruit a 1-seeded berry or a drupe; peduncle often thickened; seed pendulous, exalbuminous.

Analysis of the Genera.

Flowers paniculate, usually bisexual; anthers of
the inner stamens opening outwards.
Fruit supported only by the base of the perianth 1. CIMNAMOMUM.
Fruit supported by the entire perianth.
Perianth-segments spreading or reflexed, not
stiffened 2. MACHILUS.
Perianth-segments clasping the fruit and
stiffened 3. Phobbe.
Flowers umbellate, usually diccious; anthersall
opening inwards 4. Litsza.

1. Cinnamomum, Blume; G. P. n. 16.

1. **C. Tamala,** Fr. Nees; Fl. Br. Ind. v. 128; Brandis For. Flora 374, Ind. Trees 533; Gamble Man. Ind. Timb. 560. Vern. Dálchini, Darchini, Hind.; Gúr-ándrá, Jaunsar.

A moderate-sized tree, with thin dark-brown wrinkled bark. Leaves both alternate and opposite sometimes on the same twig, 4-6 by 1·5·2·5 in., ovate-oblong, acute or acuminate, 3-nerved, glabrous, shining above, pink when young. Panicles scarcely exceeding the leaves. Perianth of 6 unequal segments, silky-pubescent; lobes longitudinally ribbed, ovate-oblong, breaking off transversely about the middle in fruit. Perfect stamens 9, the 6 outer eglandular with 4-celled anthers opening inwards, the inner three with 2 glands at the base and 4-2-celled anthers opening outwards; innermost or fourth series of 3 short staminodes. Ovary free; style filiform. Drupe 5 inlong, ovoid, succulent, supported by the thickened peduncle and the 6-toothed or truncate base of the perianth, black when ripe.

Occurs sporadicall y in damp ravines in Jaunsar and Tehri-Garhwal, up to 6,000 ft.: Thadiár, Bagúr-nálá; Málköt, etc. Very common and almost gregarious in the Mautárgádh.

The wood is moderately hard and close-grained, but is liable to split and warp; weight 39 lbs. perc. ft. The bark of the twigs is used as a substitute for the true cinnamon, which is obtained from a cogener of this tree (C. zeylanicum, Breyn.) and the leaves are the bay-leaves or Tejpát of Indian commerce.

New leaves Apr., May. Fl. Feb.-May. Fr. June-Oct., but remaining long on the tree.

The Camphor tree, C. Camphora, Linn.; Fl. Br. Ind. v. 134;—is cultivated for ornament in the Din, where it thrives well on good soil and is well worth cultivating in plantations on a commercial scale to produce camphor.

2. Machilus, Nees; G. P. n. 17.

Evergreen trees. Leaves alternate, penniveined. Flowers bisexual, in axillary and terminal panicles. Perianth divided to the base; segments 6, persistent but unchanged in fruit. Stamens as in Cinnamomum Tamala; anthers all 4-celled. Berry globose or oblong, seated on the spreading or reflexed perianth.

Analysis of the Species.

1. M. Gamblei, King mss.; Fl. Br. Ind. v. 138, 860. Brandis Ind. Trees 531; Gamble Man. Ind. Timb. 566.

A moderate-sized tree; bark dark-grey, with even surface. Leaves 3-5 by 1-1-5 in., obovate to elliptic-lanceolate, acute or acuminate, entire, thinly coriaceous, glabrous and shining above, glaucous beneath; base cuneately acute; lateral nerves 8-10 pairs slender; petioles 5 in. long, slender, glabrous or pubescent. Panicles terminal, lax, few-flowered. Perianth-lobes linear oblong, villous within. Filaments slender, almost glabrous; anther oblong. Fruit 3 in. diam., globose, black when ripe.

Fairly common in shady and swampy localities in the Dún: Káluwála, Rámgarh, Mothronwala, Karwápáni, etc.

Wood white, appears to be soft.

Fl. Mar., Apr. Fr. June, July.

2. **M. odoratissima**, Nees; Fl. Br. Ind. v. 139, 859; Brandis For. Flora. 378, Ind. Trees 530; Gamble Man. Ind. Timb. 565. Vern. Káwalá, Jaunsar; Káulá, Kaulu, Dún.

A middle-sized tree. Leaves 4-6 by I 5-2 in., lanceolate or oblong, acuminate, dark-green and shining above, slightly glaucous beneath, impressed-punctate, lateral nerves 7-13 pairs; petiole 5-8 in. long. Panicles peduncled, shorter than the leaves. Flowers and filaments quite glabrous. Fruit 5-7 in. long, oblong or ellipsoid, purple and somewhat pruinose when ripe.

Jaunsar, Tehri-Garhwal and Outer Himalayan Valleys, $3,000\text{-}6,500~\mathrm{ft}.$

Wood light, soft and even-grained, not much used. Weight 40 lbs. per c. ft.

Fl. Mar., Apr. Fr. May, June.

3. M. Duthiei, King mss.; Fl. Br. Ind. v. 861; Brandis Ind. Trees 531; Gamble Man. Ind. Timb. 567. Vern. Káwalá, Bhojo, Jaunsar.

A tree larger than the last species; young branches sometimes finely silky. Leaves 5-10 by 1.5-2.7 in., lanceolate, oblong or oblanceolate, very coriaceous, glaucous beneath; nerves 12-20 pairs, irregular; petiole 5-1 in. Flowers larger than in the preceding species; perianth lobes linear-oblong, finely silky. Filaments glabrous. Fruit globose, 5 in. diam., on thickened pedicels.

Common in shady ravines in the HILLS, 5.000-7.500 ft.

Fl. Apr., May. Fr. June, July.

In the description of the last two species I have followed the revised sketch given at the end of Vol. V of the "Flora of British India," but there are specimens in the College Herbarium which do not exactly fall under any of them. The fruit character, however, is the most reliable of all, and the trees can easily be distinguished in the forest from the colour of their foliage and the shape and general appearance of their crowns. Besides, they generally occur in somewhat different localities.

3. Phœbe, Nees; G. P. n. 18 (Persea).

1. P. lanceolata, Nees; Fl. Br. Ind. v. 141; Brandis For. Flora 377, Ind. Trees 532; Gamble Man. Ind. Timb. 568. Vern. Bhadroi, Bhadeu, Jaunsar; Tumri, Dún.

A small evergreen tree with yellowish-white bark. Leaves alternate, crowded at the ends of the branches, 5-8 by 1-2 in., narrow-lanceolate, finely or caudate-acuminate, glabrous; lateral nerves 6-10 pairs; petiole 5-8 in. Flowers 2-sexual or polygamous, in lax axillary panicles. Perianth cup-shaped; segments obovate, scarcely acute, pubescent within, enlarging hardening and imbricate in fruit. Stamens as in Cinnamomum Tamala; anthers all 4-celled. Fruit 3-4 in. long, narrow-ellipsoidal, black when ripe, half-buried in the enlarged calyx.

In shady damp valleys or near marshes in the Dfn: Karwapani, Ramgarh, Kansrao, Khairi; also up to 6,500 ft. in the Hills, e.g., Sainji, Korwa, Mussoorie, etc.

The wood is white, hard and close-grained, but does not seem to have ever been used for timber purposes. Growth fast. Weight 46-55 lbs. per c. ft.

Fl. Feb.-June. Fr. June-Sept.

4. Litsma, Lamk.: G. P. n. 28.

Usually evergreen trees or shrubs. Leaves alternate. often crowded at the ends of the branches, generally penninerved. Flowers directions, in few-flowered umbels which are sessile or pedicellate, usually clustered and supported by 4-6 concave involucral bracts. Perianth tubular, 4-6-lobed. Stamens 6, less often 9 or 12, rarely more, those of the inner series with a pair of glands at the base; anthers 4-celled, all introrse. Fruit a drupe, seated on the much-enlarged perianth-tube, black when ripe.

Analysis of the Species.

Stamens 9 or more; lvs. penninerved throughout. Lvs. grey-tomentose beneath; fr. globose . 1. L. sebifera.

Lvs. rusty-tomentose beneath: fr. ovoid or ob-

Leaves broad; receptacle of fruit very small . 2. L. polyantha. Leaves narrow; receptacle of fruit large . 3. L. elongata.

Stamens 6; lvs. 3-nerved at the base (Genus Tetradenia. Nees).

Leaves 6-12 in. long, thickly coriaceous . . 4. L. lanuginosa. Leaves 3-6 in. long, thinly coriaceous . 5. L. umbrosa.

1. L. sebifera,* Pers.; Fl. Br. Ind. v. 157; Brandis Ind. Trees 536; Gamble Man. Ind. Timb. 570. Syn.—Tetranthera laurifolia, Jacq.; Brandis For. Flora 379. Vern. Chandná, Dún; Maidá-lakri, Hind.

A moderate-sized evergreen tree with dark-grey soft corky bark; young parts grey-tomentose. Leaves 4-10 in. long, elliptic ovate oblong or lanceolate, acute or acuminate, pubescent or glabrescent above, grey-tomentose beneath, soft-coriaceous; lateral nerves 8-12 pairs; petiole '5-1'5 in. Umbels '3-'6 in. diam.; pedicels clustered on a common peduncle 2-3 in. long; bracts 4, rounded, tomentose. Stamens 9-20 or more; filaments hairy. Fruit about 3 in. diam., globose, supported by the club-shaped pedicel.

Common in the Don and Saharanpur Forests, especially in shady ravines: Rámgarh, Karwápáni, Bádsháhibágh, Dholkhand,

etc.

^{*} According to Mr. Gamble this species ought to be called L. chinensis, Lamk.

Wood greyish-brown, close- and even-grained, durable, is not attacked by insects; heartwood not distinct; weight 46 lbs. per c. ft. "A fine wood worth notice."—Mr. J. S. Gamble. The inner bark, which is granular and viscid, is used as an external application for sprains and bruises.

Fl. Rainy season. Fr. Nov., Dec.

2. L. polyantha, Juss.; Fl. Br. Ind. v. 162; Brandis Ind. Trees 536; Gamble Man. Ind. Timb. 571. Syn.—Tetranthera monopetala, Roxb.; Brandis For. Flora 380. Vern. Karkáwa or Karká, Dún.

A moderate-sized evergreen tree with dark-grey smooth bark. Leaves 4-8 in. long, oblong ovate or obovate, tip acute or rounded, glabrous above, rusty-tomentose and strongly reticulate beneath; lateral nerves 5-10 pairs; petiole '5-1 in. Umbels stoutly pedicelled, 5-6-flowered; bracts 5, membranous. Stamens 9-13; filaments hairy. Fruit ovoid; '2-3 in. long, on a small perianth-base.

Very common in scrub forests in the Dehra Dún and Sahá-RANPUR DISTRICTS, and in low valleys in the Hills.

Wood of a dark-grey colour, not durable; weight 38 lbs. per c. ft. The bark is used in Indian medicine, and the leaves to feed cattle, and the Mugá silkworms in Assam.

- Fl. Mar., Apr. and also irregularly throughout the year. Fr. four months after flowering.
- 3. L. elongata, Wall.; Fl. Br. Ind. v. 165; Brandis Ind. Trees 537; Gamble Man. Ind. Timb. 572.

A small tree with stout branches; branchlets rusty-tomentose. Leaves alternate, very variable, generally 4-5 by 1-1.5, but occasionally much longer and broader, oblong or elliptic-lanceolate, obtuse acute or acuminate, strongly reticulate and rusty-tomentose beneath; lateral nerves few or many; base generally acute; petiole stout, 3.5 in. long. Umbels 4-5-flowered, very rarely clustered; male larger than female; pedicels of værying lengths; flowers woolly. Sepals 4-6, obtuse. Stamens 8-12; filaments slender, villous. Ovary glabrous, rudimentary in the male fis.; style stout; stigma discoid. Fruit 5 in. long, oblong, seated on a perianth-base which is 3 in. in diam.

Shady ravines in the OUTER HIMALAYA,—along the 'Mall' at Mussoorie (Mr. J. S. Gamble), Sansárú Khálá in Málköt, etc. Rather rare.

Fl. Mar., Apr. Fr. June, July.

4. L. lanuginosa, Nees; Fl. Br. Ind. v. 178; Brandis For. Flora 382, Ind. Trees 540; Gamble Man. Ind. Timb. 573.

A moderate-sized tree with brown bark. Leaves crowded at the ends of the branches, 6-12 in. long, elliptic-lanceolate or oblanceolate, acute or acuminate, very tough and coriaceous, silky-hairy when young, afterwards glabrous above, glaucous beneath, strongly sub-triplinerved at the base; petiole '3-'8 in. long. Bracts villous. Umbels in 4-fid sessile clusters nearly 1 in. in diam. Stamens 6; glands of inner stamens long-stalked. Fruit '5 in. long, acute at both ends, seated at the thickened ends of the pedicels.

Jaunsar and Tehri-Garhwal, up to 6,000 ft.; not common: Bámsu Valley, 4,000 ft. Tons Valley, 3,500 ft. Also in the Mothron-wala swamp in the Dún, 1,900 ft.

Wood yellow when fresh cut.

Fl. Feb., Mar. (?). Fr. Dec., Jan.

5. **L. umbrosa**, Nees; Fl. Br. Ind. v. 179; Brandis Ind. Trees 540; Gamble Man. Ind. Timb. 573. Syn.—*L. zeylanica*, Nees; Brandis For. Flora 382. Vern. Shúrúr, Jaunsar.

A moderate-sized evergreen tree with a spreading crown and dark-brown bark. Leaves alternate, 3-6 in. long, oblong elliptic or oblong-lanceolate, acute or acuminate, thinly coriaceous, glabrous above, glaucous beneath, usually sub-triplinerved at the base; petiole 5-1.5 in. Umbels in small 4-5-fid sessile clusters, few-flowered. Stamens 6; glands sessile. Fruit 3 in. diam., globose or oblong, on slender pedicels which are 5 in. long.

Common in Jaunsar and Tehri-Garhwal, 4,-7,000 ft., generally in shady forests or ravines.

Wood reddish-white, moderately hard; heartwood distinct with a darker colour; weight 36-38 lbs. per c. ft. Used for house-building in South India. An oil is extracted from the fruit, which is used for burning and is considered by the hill people as a specific for itches and other skin diseases.

Fl. Mar.-May. Fr. Sept., Oct.

FAM. 66. THYMELÆACEÆ; G. P. N. 145.

Small trees or shrubs. Leaves alternate or opposite, simple, entire, exstipulate. Flowers regular, usually 2-sexual; perianth tubular or campanulate; lobes 4-5, imbricate, sometimes with scales at the base. Stamens

as many or twice as many as the perianth-lobes, in the latter case in two superposed series. Ovary superior, usually 1-celled; style long or short or 0; stigma capitate; ovule solitary, pendulous. Fruit indehiscent.

Analysis of the Genera.

Leaves alternate, subcoriaceous, persistent; scales and style 0 1. DAPHNE. Leaves opposite and alternate, membranous,

deciduous; scales and style present . 2. Wikstræmia.

1. Daphne, Linn.; G. P. n. 3.

1. **D. cannabina,** Wall.; Fl. Br. Ind. v. 193; Brandis Ind. Trees 544; Gamble Man. Ind. Timb. 577. Syn.—D. papyracea, Wall.; Brandis For. Flora 386. The Paper Daphne. Vern. Dhák Chamboi, Chamua, Jaunsar; Satpurá, Garhwal.

An evergreen shrub, 4-6 ft. high, with smooth grey bark. Leaves 2-4 in. long, oblanceolate or narrow-lanceolate, subcoriaceous, glabrous; nerves very slender, depressed above, just visible below; petiole short, marginate, channelled. Flowers scented, white, in sessile terminal heads, supported by oblong or lanceolate hairy bracts. Perianth-tube '5-'7 in. long, slender, white-pubescent outside; lobes 4, short, acute. Scales 0. Stamens 8, in two series, one above the other. Stigma sessile or subsessile, capitate. Fruit a berry '5-'7 in. long, ovoid, orange while ripening, deep-red or ruby when fully ripe, succulent, with a coriaceous rind.

JAUNSAR and Tehri-Garhwal, 4,000-9,500 ft. Very common in the Korwá and Lúrli Forests.

In Nepal and Kumaon paper is made out of the inner fibrous bark.

Fl. Mar., Apr., often also in autumn. Fr. Two months after fl.

2. Wikstræmia, Endl.; G. P. n. 11.

1. W. canescens, Meissn.; Fl. Br. Ind. v. 195; Brandis Ind. Trees 545; Gamble Man. Ind. Timb. 578. Syn.—W. virgata, Meissn.; Brandis For. Flora 386. Vern. Chamboi, Jaunear.

A small shrub with a few slender branches. Leaves 1-3 in.. oblong-lanceolate, acute, membranous, often slightly pubescent; petiole 'l in. long. Flowers white or yellowish, subsessile, in fewflowered heads, spikes or cymes. Perianth '3 in. long, slender, silky outside; lobes 4. Disk-scales 1-4, linear. Stamens 8, in two series, one above the other Style short; stigma large. Fruit 2 in. long, narrowly ovoid, silky,

JAUNSAR and TEHRI-GARHWAL, 5,-8,000 ft.: Deoban, Konáin, Mundáli, Kathián; Deotá, etc.

Fl. Apr.-June. Fr. Two months after fl.

FAM. 67. ELÆAGNACEÆ: G. P. N. 147.

Shrubs or trees with silvery or brown scales. Leaves usually alternate, entire, exstipulate. Flowers regular 1-2-sexual, in axillary fascicles or cymes. Perianth tubular; lobes valvate in bud. Stamens usually 4, epiphyllous, alternating with the perianth-lobes. Ovary superior, 1-celled, with a solitary erect ovule. Fruit indehiscent, enclosed in the accrescent perianth-tube.

Analysis of the Genera.

. . l. Elæagnus. Fls. normally 2-sexual; perianth 4-fid Hls. 1-sexual, diœcious; perianth 2-partite or 2-fid. 2. HIPPOPHAE.

1. Elæagnus, Linn.; G. P. n. 1.

Shrubs or small trees, sometimes spinescent. Leaves alternate, covered with dense silvery scales beneath. Flowers 2-sexual or 1-sexual by abortion. Perianthtube constricted above the ovary; lobes 4, valvate, deciduous. Stamens 4. Fruit with a bony or corisceous endocarp.

Analysis of the Species.

An erect deciduous shrub; leaves narrow;

fruit 3 in. long 1. E. umbellata.

A straggling evergreen shrub ; leaves broad ;

fruit about 1 in. long . . . 2. E. latifolia.

1. **E. umbellata,** Thunb.; Fl. Br. Ind. v. 201; Brandis For. Flora 390, Ind. Trees 547; Gamble Man. Ind. Timb. 580. Vern. Ginroi, Jaunsar.

A thorny deciduous shrub with numerous branches, often forming a dense bush. Leaves 1-3 by '3-'7 in., oblong or lanceolate, acute at both ends, clothed below with bright silvery scales, sparsely scaly or pubescent above; nerves indistinct; petiole '2-'3 in. long. Flowers dull-white, silvery outside, appearing with the leaves, in small axillary clusters. Perianth '2 in.; lobes triangular-ovate. Fruit '3 in. long, oblong-ovoid, succulent, ribbed outside.

JAUNSAR, TEHRI-GABHWAL and outer slopes of the Hima-LAYA, usually 3, 7,000 ft. Between Saiá and Korwá; below Konián; Dhárágádh, etc.

The fruit is eaten.

Fl. Apr.-June. Fr. Rainy season.

2. **E. latifolia,** Linn.; Fl. Br. Ind. v. 202; Brandis For. Flora 390, Ind. Trees 547; Gamble Man. Ind. Timb. 581. Vern. Lcháru, Garhwal.

A straggling shrub, often spiny. Leaves very variable, usually 3-6 by 1.5-2.5 in., ovate-oblong, acuminate, membranous, clothed beneath with silvery or ferruginous scales; margins often slightly undulate; lateral nerves 6-8 pairs; petiole 3-4 in. long, channelled. Flowers few or numerous, in axillary clusters; pedicels elongated in fruit. Perianth-lobes broad. Fruit about 1 in. long, sometimes longer, elliptic-oblong or pyriform, strongly 8-ribbed, red or yellow when ripe; endocarp silky inside.

Mothronwála, Nakraunda and Lachiwála swamps, Dehra Dún, and possibly in similar places elsewhere.

The acid but somewhat astringent fruit is eaten by villagers. Fl. Nov.-Feb. Fr. May, June.

2. Hippophaë, Linn.; G. P. n. 2.

1. **H. rhamnoides**, Linn.; Fl. Br. Ind. v. 203; Brandis For. Flora 388, Ind. Trees 547; Gamble Man. Ind. Timb. 581. Vern. Dhurchuk, Tárwa, Chumá, U. P.

A large thorny diocious shrub, sometimes a small tree; bark dark-grey, rough with vertical furrows. Leaves alternate, 5-2 by 1-3 in., subcoriaceous, glabrescent above, felted with grey or rust-coloured scales beneath. Male Fis. in axillary clusters on the old wood; perianth with 2 opposite segments. Fis. axillary, solitary, pedicelled; perianth tubular, 2-denate. Fruit oblong or globose, orange or bright-scarlet when ripe, enclosed in the succulent perianth.

UPPER TONS VALLEY, TEHRI-GARHWAL: Dátmir and Oshlá; chiefly in moist gravelly stream-beds.

It is used for fuel and charcoal and the dry branches for hedges. The fruit is very acid, but boiled with sugar forms a palatable preserve.

Fl. Mar., Apr. Fr. July, Aug.

Very similar in appearance and hardly specifically different is *H. salicifolia*, Don. *Leaves* membranous, covered beneath with stellate hairs and scales. Gangottari and other places in Tehri-Garhwal.

Order 4.—SANTALALES.

FAM. 68. LORANTHACEÆ; G. P. N. 148.

Parasitic evergreen shrubs. Leaves generally opposite, exstipulate, entire, coriaceous. Flowers 1-2-sexual, usually bracteate. Perianth single or double; the outer (calyx) usually adnate to the ovary, limb truncate or 0; the inner (corolla) free or connate, valvate in bud. Stamens as many as, and opposite to, the lobes of the inner perianth. Ovary inferior, 1-celled, with usually one erect ovule. Fruit generally drupaceous, 1-seeded; albumen fleshy.

Analysis of the Genera.

Fls. 2-sexual, showy; style long . . . 1. LORANTHUS.

Fls. 1-sexual, inconspicuous; style short or 0 . 2. VISCUM.

1. Loranthus, Linn.; G. P. n. 2.

Leaves generally opposite. Flowers 2-sexual, usually large, showy. Calyx adnate to the ovary; limb entire or minutely toothed. Petals free or more or less connate into a tube. Stamens epipetalous, subequal. Style long, stigma capitate. Fruit a fleshy drupe.

Analysis of the Species.

Flowers 4-merous.

Petals free; (leaves glabrous) . 1. L. ligustrinus.

Petals connate into a tube.

Leaves scurfy on both surfaces when
young; peduncles many-flowered.

Corolla buff or pink . 2. L. Scurrula.

Corolla green . 3. L. pulverulentus.

Leaves always glabrous above;
peduncles few-flowered . 4. L. vestitus.

Flowers 5-merous (leaves glabrous; petals
red, connate into a tube) . 5. L. longiforus.

1. L. ligustrinus, Wall.; Fl. Br. Ind. v. 207; Brandis For. Flora 395, Ind. Trees 549; Gamble Man. Ind. Timb. 582. Vern. Pándá. Hind.

A parasitic shrub, often apparently terrestrial. Leaves opposite, the upper sometimes alternate, 2-3 5 by 6-1 in., lanceolate, thinly coriaceous, glabrous. Flowers 3 in. long, rust-coloured or pale-pink outside, deep-red inside, in axillary panicles or racemes; bracts persistent. Calyx-limb entire. Corolla-segments linear, reflexed from the middle. Ovary rusty-tomentose. Fruit ovoid, 2-3 in. long, brown when ripe.

Occasionally met with in the Don Forests: Rámgarh, Karwáráni, Mothronwála, etc.

Fl. May, June.

2. L. Scurrula, Linn.; Fl. Br. Ind. v. 208; Brandis Ind. Trees 549; Gamble Man. Ind. Timb. 582.

A very variable parasite with many distinct varieties. The following description refers to the variety found in the Siwalik Division. Leaves 2-4 in., opposite, ovate-oblong or obovate, young on both surfaces and old beneath scurfy or grey-tomentose; base rounded or cordate; petiole '3-'6 in. Flowers '2-1 in., very slender, usually buff outside, in axillary fasciples or short racemes; buds

terete, with an acute tip. Calux-limb wholly truncate. Corolla slightly curved. '5-1 in. long: lobes 4, short. Style filiform, purple. Fruit 2-3 in., obconic.

Fairly common in the SIWALIK TRACTS.

Fl. Cold season.

Very closely allied to this is L. cordifolius, Wall.; Fl. Br. Ind. v. 209.—differing only in larger and more distinctly cordate leaves, and copious white tomentum: indeed some botanists suggest its being a variety of L. Scurrula. SUB-HIMALAYAN and SIWALIK (?) TRACTS.

3. L. pulverulentus, Wall.; Fl. Br. Ind. v. 211; Brandis For. Flora 396, Ind. Trees 549; Gamble Man. Ind. Timb. 582. Vern. Parand. Kumaon: Bándá. Hind.

A stout woody parasite with dark-grey bark. Leaves opposite. 4-6 in. long, broadly ovate or ovate-oblong, coriaceous, thickly mealytomentose when young; base acute or rounded; petiole 5-7 in. long. Racemes 5-2.5 in. long, axillary, solitary or fascicled. Flowers 1 in. long. Pedicels 2-3 in. long, grey-scurfy outside. Calyx-limb 0. Corolla slender, tubular, curved; segments 4, linear, green. Style very slender. Fruit 3 in. long, turbinate, grey-tomentose.

A common parasite in the Dun and Saharanpur Forests. Has been found on Butea trondosa, Dalbergia Sissoo and many other trees.

Fl. Sept.-May, and probably throughout the year.

4. L. vestitus, Wall.; Fl. Br. Ind. v. 212; Brandis For. Flora 396, Ind. Trees 549; Gamble Man. Ind. Timb. 582. Vern., Pand, Hind.

A robust woody parasite. Leaves opposite, '2-3 by '7-1'2 in., oblong ovate or elliptic, glabrous, deep-green and shining above, densely ferruginous-tomentose beneath; margins recurved; base acute; petiole 2-3 in long. Flowers 5-7 in long, rusty outside, in few-flowered clusters. Calyx distinctly toothed. Corolla tubular, lobes very short, obtuse: buds with a globose apex. Fruit 3-5 in. long, usually ovoid; seed imbedded in a viscid pulp.

Fairly common in JAUNSAR and TEHBI-GARHWAL and generally found on Oaks, especially Quercus incana; e.g., at Kathián, where hardly any tree has escaped.

FL throughout the year, chiefly Oct.-Jan.

5. L. longiflorus, Desrouss.; Fl. Br. Ind. v. 214; Brandis For. Flora 397, Ind. Trees 549; Gamble Man, Ind. Timb. 583. Vern. Pándá, Hind.

A large woody parasite, with handsome flowers. Leaves opposite or alternate, 3-10 by '5-5 in., very variable in shape, coriaceous, brittle when fresh, glabrous, young usually pink; nerves very faint; petiole '3-'7 in. Flowers 1'5-2'5 in. long, scarlet or orange, sometimes tipped with green, in axillary or supra-axillary unilateral racemes which are 1-4 in. long. Calyx-limb truncate or with short sharp points. Corolla tubular, curved, somewhat swollen near the middle, split halfway down at the back; segments 5, linear. Ovary cylindrical or urceolate, glabrous. Fruit '3-'5 in. long, oblong, black when ripe.

Extremely common, and has been found on most trees in the Dun and Saharappur Forests, ascending to 7,500 ft. in Jaunsar and Tehri-Garhwal, where, however, the flowers are rather smaller and not quite so vividly coloured.

Fl. almost throughout the year but chiefly Nov.-June.

2. Viscum, Linn.; G. P. n. 3.

Parasitic shrubs with dicho- or trichotomous branches. Leaves opposite or wanting. Flowers unisexual, minute, solitary or fascicled in the axils of the leaves, or at the nodes of the branches. Perianth-segments 3-4, very thick, usually deciduous. Anthers sessile, epiphyllous, opening by many pores. Stigma sessile, large. Fruit succulent; embryos 1-2 in each seed in fleshy albumen.

Analysis of the Species.

Branches terete, leafy; flowers diœcious; berries

white 1. V. album.

Branches flattened, leafless; flowers usually monœcious; berries pale-green or yellow.

Internodes 1-2 in., striate or furrowed;

perianth-lobes deciduous . . . 2. V. articulatum.

Internodes 2-6 in., with only a middle line or none; perianth-lobes persistent . 3. V. japonicum.

1. **V. album,** Linn.; Fl. Br. Ind. v. 223; Brandis For. Flora 392, Ind. Trees 552; Gamble Man. Ind. Timb. 583. The Mistletoe. Vern. *Chúlú-ká Bándá*, Jaunsar.

A large parasitic shrub, green all over; branches dichotomous or whorled. Leaves about 2 by '4 in., sessile, cuneate-oblong or

oblanceolate, with 3-5 longitudinal basal nerves. Flowers diœcious, sessile, in clusters of 3-5, supported by concave bracts. Perianth-segments 3-4, triangular, deciduous. Fruit 2-3 in. long, ellipsoid, white, smooth, almost transparent.

JAUNSAR and TEHRI-GARHWAL, up to 6,000 ft. (Lambátách), chiefly on Rosaceous shrubs, and on elm, walnut and willows.

It is used medicinally, and bird-lime is made of the viscid pulp of the fruit.

Fl. Mar.-May. Fr. Sept.-Nov.

2. **V. articulatum**, Burm.; Fl. Br. Ind. v. 226; Brandis Ind. Trees 552. Syn.—V. attenuatum, D.C.; Brandis For. Flora 394, Vern. Budu, Pand, Hind.

A much-branched, leafless, green parasite, greenish-yellow when dry. Main stem terete; branches flat, longitudinally striate and furrowed, contracted at the nodes, pendulous; internodes widening upwards, 1-2 in. long. Flowers sessile, in sessile 3-flowered spikes, two or several spikes at a joint. Fruit subglobose, 15 in. long, yellow when ripe.

The SIWALIKS and OUTER HIMALAYA, up to 6,000 ft. Found on Cordia vestita, Cornus capitata, Pyrus Pashia, etc.

Fl. Rainy season.

3. **V. japonicum**, Thunb.; Fl. Br. Ind. v. 226; Brandis Ind. Trees 552, Syn.—*V. 'articulatum*, Burm.; Brandis For. Flora 393, Vern. *Pand*, *Báná*, *Bándá*, Hind.

A much-branched, small, tufted, leafless parasite. Main stem dark-grey, terete; branches flat and much contracted at the nodes, looking much like strings of beads; internodes 2-3 in. long, linear-cuneate, usually with a medial ridge. Inforescence as in V. articulutum. Flowers very minute; perianth-segments 3-4, persistent. Fruit 1 in. long, globose, greenish-yellow.

JAUNSAR and TEHRI-GARHWAL, up to 8,000 ft. Appears to be very partial to the Oaks, especially *Q. ineana*, e.g., at Kathián. *Rhue*, *Olea*, *Rhododendron* and Apricot trees have also been known to be attacked.

Fl. May-July. Fr. Oct., Nov.

FAM. 69. SANTALACEÆ; G. P. N. 149.

Trees, shrubs or herbs, generally parasitic on roots. Leaves alternate or opposite, simple, exstipulate, entire, sometimes wanting. Flowers regular, small, green, 1-2-sexual. Perianth generally superior, campanulate. Stamens opposite the perianth-lobes. Ovary usually inferior, 1-celled; placentation free-central. Fruit a nut or a drupe; seed globose, in copious fleshy albumen.

1. Osyris, Linn.; G. P. n. 17.

1. **O. arborea,** Wall.; Fl. Br. Ind. v. 232; Brandis For. Flora 399, Ind. Trees 554; Gamble Man. Ind. Timb. 588. Vern. Dálmi, Dálimá, Garhwal and Kumaon.

A fairly large twiggy shrub parasitic on roots; branchlets sharply 3-angled. Leaves alternate, 1-2 in. long, subsessile or with a short marginate petiole, obovate elliptic-oblong or lanceolate, mucronate. Flowers minute, polygamous. MALE FLS. in axillary long-peduncled clusters. FEMALE FLS. usually solitary, axillary, on stender drooping pedicels. Perianth-lobes conical, valvate. Ovary inferior; placenta very short. Drupe sub-globose, 3 in. diam., glabrous, red when ripe.

Not uncommon in the OUTER HIMALAYA and in the SIWALIK TRACTS: Tháno, Málköt, Rájpur, Saiá, near the watershed behind Ránipur, etc. Also found at Naintwár in Tehri-Garhwal.

Wood reddish-brown, hard, compact and close-grained.

Fl. Almost throughout the year. Fr. Chiefly cold season.

This small Family is remarkable as the one to which the Sandalwood, Santalum album, Linn.,—Fl. Br. Ind. v. 231, Vern. Chandan, Hind.,—belongs. Leaves opposite, 2-3 in. long, elliptic-ovate. Flowers small, inodorous. Fruit a globose drupe. This most valuable tree is indigenous in Southern India, particularly in Mysore. It has been successfully grown at Dehra Dén.—G. P. n. 11.

Order 5.—EUPHORBIALES.

FAM. 70. EUPHORBIACEÆ; G. P. N. 151.

Herbs, shrubs or trees, sometimes with milky juice. Leaves alternate or opposite, usually stipulate, rarely

compound. Inflorescence various. Flowers generally small, always unisexual. Perianth usually single and calycine, rarely double or wholly wanting. Stamens various; anthers usually 2-celled. Ovary generally 3-celled, rarely 1-2- or more than 3-celled; styles as many as the carpels, free or connate, entire or divided; ovules 1 or 2 in each cell, pendulous from the inner angle of the cell. Fruit a capsule or a drupe, rarely a berry. Seeds oily, usually with a copious albumen; radicle superior; cotyledons flat.

Analysis of the Genera.

J ,
Fleshy plants with thick branches and milky juice 1. EUPHORBIA.
Trees or shrubs not fleshy.
Leaves trifoliolate 10. Bischofia.
Leaves simple.
a. Leaves large, usually over 4 in. long.
Leaves more or less rounded at the
Leaves fleshy, lobed. Plants with
opaque juice 13. Jatropha.
Leaves tough, not lobed. Plants
not juicy.
Leaves opposite, cordate; fruit
indehiscent 14. TREWIA.
Leaves alternate, punctate; fruit
a capsule.
Lvs. orbicular, usually peltate 16. MACARANGA.
Lvs. ovate, not peltate 15. MALLOTUS.
Leaves alternate, not punctate,
closely parallel veined; fruit a
berry-like drupe 4. Bridelia.*
Leaves narrow-lanceolate, base acute.
Lvs. crenate. Plants with milky
juice 17. SAPIUM (insigne)
Lvs. entire. Plants without milky
juice 11. DAPHNIPHYLLUM

^{*} Bride'ia leaves are very variable, sometimes large, often quite small, according to locality and also position on the plant.

b. Leaves middle-sized, usually under 4 in. long and 1 in. broad.
Nerves many, closely parallel . 4. Bridelia.
Nerves few, not closely parallel.
Leaves serrulate; fruit a tomen-
tose drupe 8. Putranjiva.
Leaves entire.
Fruit a compressed drupe;
pericarp fleshy 12. Antidesma.
Fruit indehiscent, lobed; peri-
carp hardened 9. Cyclostemon.
Fruit a capsule.
Calyx valvate; cocci un-
divided 17. Sapium(sebiferum).
Calyx imbricate; cocci 2-valved
Styles recurved 7. FLUEGGEA.
Styles confluent 6. GLOCHIDION.
c. Leaves small and thick, usually not
more than '5 in. broad.
Leaves alternate; fruit indehiscent. 2. Sabcococca.
Leaves opposite; fruit a capsule . 3. Buxus.
d. Leaves very small, usually under 1 in.
by 2 in 5. Phyllanthus.

1. Euphorbia, Linn.; G. P. n. 2.

Herbs or soft-wooded shrubs with copious milky juice. Leaves alternate, with or without strong stipular prickles, sometimes opposite or whorled especially on flowering branches. Flowers in heads resembling single flowers, consisting of a cup-shaped involucre which encloses many male flowers and one central female flower; involucre-lobes 4-5 with thick horizontal glands at the sinuses; glands sometimes winged and petaloid. Male fl. consists of a pedicelled, articulated, often bracteolate stamen; anther-cells usually globose. Female fl. a pedicelled 3-celled ovary in the centre of the involucre, often protruding and recurved. Styles 3, free or connate, usually 2-fid. Capsule of three 2-valved cocci.

Analysis of the Species.

Branches sub-cylindrical . . . 1. E. Nivulia. Branches with 5-7 prominent angles . 2. E. Royleana.

1. E. Nivulia, Ham.; Fl. Br. Ind. v. 255; Brandis For. Flora 439, Ind. Trees 558; Gamble Man. Ind. Timb. 590. Vern. Thor. Thuor. Dún; Súrú, Jaunsar; Senhúr, Hind.

A large shrub or small tree; branches in whorls of 4, fleshy, nearly cylindrical, with vertically or spirally arranged tubercles each supporting a pair of stipular prickles. Leaves alternate, 6-12 in. long, obovate-oblong or linear; tip rounded; midrib much elevated beneath; lateral nerves indistinct. Involucres 3 together, central sessile male, lateral pedunculate with only male or both male and female flowers; lobes fimbriate, erect, ovate; bracteoles many. Capsule 3 in. diam.; seeds smooth.

Dry rocky hills in the Outer Himalaya and Tehri-Garhwal; rather rare. Cultivated at Dehra.

Leafless in cold and dry seasons. Fl. Mar., Apr. Fr. May.

2. **E. Royleana**, Boiss.; Fl. Br. Ind. v. 257; Brandis For. Flora 438, Ind. Trees 558; Gamble Man. Ind. Timb. 591. Vern. Thor, Thuor, Dún; Súrú, Jaunsar; Senhúr, Hind.

A large milky shrub with thick fleshy 5-7-gonous branches; ridges wavy with a pair of stipular prickles at the crest of each wave. Leaves alternate, sessile, 4-6 in. long, spatulate, very shortly mucronate, fleshy; lateral nerves 6-8 pairs, irregularly reticulate, quite indistinct until dry. Involucres hemispheric, about '5 in. across, greenish-yellow, 3-4 together inaxillary subsessile clusters; lobes fimbriate. Styles combined up to the middle. Capsule '6 in. diam., 3-gonous; peduncles up to '5 in. long.

OUTER HIMALAYA and valleys in JAUNSAR and TEHRI-GARHWAL, up to 5,000 ft.: Málköt, Kálsi, Saiá, Tons Valley (Morágádh), etc.

It grows readily from cuttings and is often planted in hedges.

Leafless throughout the cold and hot seasons. Fls. and Fr.

Mar.-May.

2. Sarcococca, Lindl.; G. P. n. 18.

1. **S. pruniformis,** Lindl.; Fl. Br. Ind. v. 266; Brandis Ind. Trees 565; Gamble Man. Ind. Timb. 592. Syn.—S. saligna, Muell. Arg.; Brandis For. Flora 448. Vern. Tiliári, Jaunsar.

A small evergreen shrub. Leaves variable, usually 1-3 in. long, elliptic or lanceolate, quite entire, coriaceous, glabrous, shining above, often 3-nerved at the base; lateral nerves faint. Flowers '3 in. diam., pale-yellow, monœcious, bracteate, in short axillary racemes. Bracts whitish, decussate. Sepals 4, imbricate, in two series, oblong, obtuse. Stamens 4, free, much longer than the sepals and opposite to them. Ovary 2-3-celled; ovules 2 in each cell; styles 2-3, at length recurved. Fruit a berry, '3-'5 in. long, ovoid, purple when ripe.

JAUNSAR and TEHRI-GARHWAL, 5,-9,000 ft., generally gregatious in shady places.

Wood white, close-grained, moderately hard, sometimes used for walking sticks.

Fl. Mar.-May. Fr. June-Aug.

3. Buxus, Linn.; G. P. n. 19.

1. **B. sempervirens**, Linn.; Fl. Br. Ind. v. 267; Brandis For. Flora 447, Ind. Trees 559; Gamble Man. Ind. Timb. 592. The Box. Vern. *Pápri*, *Sansádu*, Jaunsar; *Chikri*, Punjab.

A small or middle-sized tree with 4-sided branchlets; bark yellowish-grey, soft, corky, fissured in crocodile-pattern on old stems. Leaves opposite, 1-3 by '2-'4 in., linear-oblong or lancelate, shining, glabrous; tip acute obtuse or retuse; petiole very short. Flowers apetalous, monœcious, sessile, bracteate, in short congested axillary spikes. Disk 0. Male fls.: Sepals 2 pairs, one inside the other and imbricating with it, yellowish. Stamens 4, free, opposite the sepals, exserted. Female fls.: Sepals 6, in two or three series, the outer smallest, all imbricate, yellowish. Ovary 3-celled, with 2 ovules in each cell; styles 3, simple, short, thick, persistent; stigma 2-lobed. Capsule '5 in. long, ovoid, loculicidally 3-valved, wrinkled; valves dehiscing through the styles, each valve having two halves. Seeds oblong, trigonous, with a black shining testa and a fleshy albumen.

Jádi and Mátkángrá Blocks in the Deoban Range, Jaunsar, and in the Jumná Valley, Tehri-Garhwal, always in shady rocky ravines.

Boxwood is yellowish-white, hard, very close- and evengrained. Pores very small, medullary rays extremely fine, both very numerous. Annual rings distinct but narrow, the growth being very slow. Weight about 60 lbs. per c. ft. It is the nearest approach to ivory and is used for engraving, turning, carving and mathematical instruments. In India, however, it is chiefly carved into combs and various other articles, the principal market being Amritsar in the Punjab.

Fl. Mar.-May. Fr. June-Aug.

4. Bridelia, * Willd.; G. P. n. 22.

Trees or shrubs, sometimes climbing. Leaves alternate, entire, with prominent lateral nerves. Flowers monœcious or diœcious, small, bracteate, in axillary sessile (rarely spicate) clusters. Calyx 4-5-cleft; lobes valvate. Petals 5, alternating with, and smaller than, the calyx-lobes. Male fls.: Stamens 5, united below in a column in the centre of a flat sinuate disk. Female fls.: Ovary 2- rarely 3-celled, on a cup-shaped membranous disk which is variously lobed. Styles 2, bifid. Fruit a soft drupe with 2 (or 1) usually indehiscent 1-seeded pyrenes.

Analysis of the Species.

A large tree; leaves rigidly coriaceous, with straight nerves; bracteoles few, coriaceous; calyx enlarged in fruit 1. B. retusa.

A small tree; leaves membranous, with more or less arcuate nerves; bracteoles numerous, membranous; calyx not enlarged in fruit . 2. B. montana.

1. **B. retusa**, Spreng.; Fl. Br. Ind. v. 268; Brandis For. Flora 449, Ind. Trees 560; Gamble Man. Ind. Timb. 595. Vern. Ekdániá, Gondni, Saháranpur; Gáyá, Khájá, Dún and Garhwal.

A large or middle-sized deciduous tree, with strong spines when young; bark thin, grey or brownish-black. Leaves very variable, 3-6 in. long, obovate elliptic oblong or ovate, rigidly ocriaceous, glabrous above, glabrous or glaucous beneath; lateral nerves 15-22 pairs, strong, straight, parallel; petiole '2-'5 in. long; stipules deciduous. Flowers diccious, yellow, small, subsessile; bracts villous.

Calyx 2 in. diam.; lobes ovate. Petals fleshy. Fruit 3 in diam., globose, green, purplish-black when ripe, supported by the somewhat enlarged calyx; pyrene generally solitary.

Throughout the Siwalik Division, especially in the moister parts; often associated with Sál.

Sapwood yellowish-white; heartwood grey or olive-brown, hard, compact, even- and close-grained, seasons well; annual rings distinct; weight about 50 lbs. per c. ft. The wood is used for carts, agricultural implements and building, also for drums in the Kheri District. It stands well under water and might be used for well-curbs. The bark is used for tanning; the ripe fruit is sweetish and is eaten, and the leaves are used as cattle-fodder.

New leaves May, June. Fl. May-July. Fr. Oct.-Jan.

2. **B. montana**, Willd.; Fl. Br. Ind. v. 269; Brandis For. Flora 450, Ind. Trees 560; Gamble Man. Ind. Timb. 596. Vern. *Gondni*, Saháranpur.

A small or moderate-sized deciduous tree, often only a shrub, with a short trunk and a low spreading crown; bark dark-grey; branchlets warted. Leaves very variable, 3-6 in. long, obovate or broad-elliptic, glabrous or shining above, paler beneath; lateral nerves 10-15 pairs, more or less arched; petiole 1-3 in. long; stipules deciduous. Flowers monœcious (?),* small, greenish-yellow, shortly pedicelled; bracts many and crowded, membranous, pubescent. Calyx 1-3 in. diam; lobes triangular-ovate, unaltered in fruit. Petals oblanceolate. Fruit ovoid, 2 in. long, black when ripe.

Fairly common in ravines or banks of raus, up to 3,500 ft., especially in the Siwaliks. Wood mottled, otherwise very similar to that of the last species, and might be used for the same purposes to the extent its smaller size would allow; weight 46-59 lbs. per c. ft. The leaves are lopped for fodder, but the fruits are not eaten.

Fl. Apr., May (Sir D. Brandis), but Oct., Nov. (a second flush?) in the Dún. Fr. Nov.-Apr.

5. Phyllanthus, Linn.; G. P. n. 34.

1. **P. Emblica**, Linn.; Fl. Br. Ind. v. 289; Brandis For. Flora 454, Ind. Trees 570; Gamble Man. Ind. Timb. 599. Vern. Aonlá, Anlá, Aolá, Hind.

^{*} Fide Fl. Br. Ind. and Brandis For. Flora; but I have seen several trees with only male, and several others with only female flowers, and, so fag, none with both.

A moderate-sized deciduous tree; bark grey, exfoliating in irregular patches, red inside; branchlets finely pubescent. Leaves '3-5 in. long, subsessile, linear-oblong, acute or mucronate, distichously close-set on deciduous branchlets, together having the appearance of pinnate leaves; stipules minute. Flowers apetalous, monœcious, greenish-yellow, in axillary clusters. MALE FLS: numerous and shortly pedicellate. Stamens 3, joined in a short column. Disk of distinct glands, alternating with the calyx-segments, rarely 0. Female Fls: Sepals as in the male flowers. Ovary 3-celled, with 2 ovules in each cell; styles 3, connate at the base, twice bifid. Fruit of three 2-valved cocci, '5-'7 in. diam., obscurely 6-lobed, globose, fleshy, pale-yellow, dehiscent only when dry.

Throughout the SIWALIK DIVISION, and up to 4,500 ft. in JAUNSAB and TEHRI-GARHWAL; very common.

Wood red, hard and close-grained, but warps and splits in seasoning; it is, however, durable under water, and yields charcoal of excellent quality. Heartwood and annual rings not distinct; weight about 50 lbs. per c. ft. The bark and fruit are used in medicine and also for tanning. The fruit is eaten raw or pickled, and is believed to be good for chronic biliousness.

Leafless Feb.-Apr. Fl. Mar.-May. Fr. Cold season.

P. parvifolius, Ham.; Fl. Br. Ind. v. 294,—is a small prostrate shrub which has been found below Mussoorie, 5,6,000 ft., by Rai Bahádur Keshavánand, too late to be described in full. Leaves 15.25 in long, obovate. Flowers minute. Fruit a capsule, 12 in. diam.

6. Glochidion, Forst.; G. P. n. 34.

(Placed under Phyllanthus in the "Genera Plantarum.")

Evergreen trees or shrubs. Leaves alternate, bifarious, entire. Flowers usually monœcious, apetalous, small. Male fls.: Sepals 6, imbricate, in two series. Anthers 3-8, connate into a column; connectives produced. Disk without glands. Female fls.: Calyx of 5-6 free or connate sepals. Ovary 3-15-celled; ovules two in each cell. Styles variously united in a column. Fruit of 3 or more 2-valved cocci, quite globular or

depressed, generally more or less lobed. Seeds hemispherical, albuminous.

Analysis of the Species.

Lvs. glabrous; anthers 4-6; branchlets angular 1. G. lanceolarium. Lvs. velvety; anthers 3; branchlets terete . 2. G. velutinum.

1. **G. lanceolarium**, Dalz.; Fl. Br. Ind. v. 308; Brandis Ind. Trees 573; Gamble Man. Ind. Timb. 601. Syn.—*Phyllanthus laneoclarius*, Muell. Arg.; Brandis For. Flora 453.

A glabrous tree about 25 ft. high; bark grey, with longitudinal wrinkles. Leaves 4.6 in. long, elliptic-oblong or lanceolate, acuminate, coriaceous, glabrous, shining; lateral nerves 6-10 pairs; base acute; petiole channelled, 2-4 in. long; stipules triangular. Flowers pale-green, in axillary fascicles,—male numerous and long-pedicelled; female few, sessile or shortly pedicelled. MALE FLS.: Calyx of 6 linear-oblong segments. Anthers 4-6, oblong, on a short column. Female Fls. smaller; Calyx of 6 acute, rigid, unequal segments. Ovary 6-8-celled, villous. Styles 6, connate into a glabrous conical column. Capsule 3-5 in. diam., depressed, 8-lobed.

Fairly common in moist localities in the Eastern Dún: Nichlá Súswá Block, Kánsráú, Nakraunda, etc.

The wood is believed to be hard and durable.

'Fl. Cold season. Fr. Mar.-May.

2. **G. velutinum**, Wight; Fl. Br. Ind. v. 322. Brandis Ind. Trees 574; Gamble Man. Ind. Timb. 602. Syn.—Ph₃ l-lanthus nepalensis, Muell. Arg.; Brandis For. Flora 452. Vern.

Anwin, Jaunear; Chamári, Dún; Kath Mauvá, Garhwal.

A small tree, tomentose throughout. Leaves 2.5 in. long, ovate elliptic or oblong, rather coriaceous, glabrate above; lateral nerves 4.6 pairs; base rounded or obtuse; petiole '1-15 in. long; stipules subulate. Flowers in axillary fascicles,—the male on long slender pedicels; the female subsessile. Calyx of 6 segments, hairy outside. MALE FIS.: Anthers 3, oblong; connective prolonged. Female Fls. densely clustered. Styles connate into a cylindrical column. Capsule '3-5 in diam., depressed, usually 4-celled and deeply 8-lobed.

Common in the Dun and Sanaranpur Forests, also in low valleys (Tons, etc.) in Jaunsar and Tehri-Garhwal.

· Wood brownish-white, compact. The bark is used for tanning.

Fl. Feb.-Apr. Fr. June-Aug.

7. Flueggea, Willd.; G. P. n. 38.

1. **F. microcarpa**, Bl.; Fl. Br. Ind. v. 328; Brandis Ind. Trees 569; Gamble Man. Ind. Timb. 603. Syn.—Securinega obovata, Muell. Arg.; Bran is For. Flora 455. Vern. Rithoul, Dún.

A small tree with rusty or reddish-brown thin bark and angular branchlets marked with small white specks; branches straight and regularly fluted. Leaves very variable, 1-4 in. long, elliptic ovate obovate or orbicular, membranous but tough, rather glaucous beneath; tip rounded obtuse or acute, rarely acuminate or retuse; lateral nerves 6-8 pairs, very slender; petiole '1-3 in. long, slender. Flowers diœcious, very small, pedicelled; usually in axillary fascioles. Sepals 5, imbricate. MALE FLS.: Stamens 5, alternating with disk-glands but opposite to the sepals; pistillode large, 3-fid. Female Fls.: Ovary ovoid, on an annular disk; styles 3, 2-fid. Fruit of two sizes, mostly small and dry, about '1-'15 in. diam., with a few larger ones, '3 in. diam., which are white and fleshy; seeds 3-6, punctate.

Very common along the foot of the SIWALIKS in the SAHÁRAN-PUR DISTRICT, especially towards the west, and generally in scrub forests in the Dún: Sháhjahánpur, Kasúmri, Barkálá, Lachiwála, Gulargháti, Káunli, etc.

Wood reddish-white, close-grained, strong and durable, used for agricultural implements; weight 52 lbs. per c. ft. The branches make handsome walking-sticks, and are much used for the framework of thatched roofs as a substitute for bamboos. The bark is astringent, and is used to intoxicate fish.

Fl. Apr., May. Fr. Sept.-Nov.

8. Putranjiva, Wall.; G. P. n. 41.

1. P. Roxburghii, Wall.; Fl. Br. Ind. v. 336; Brandis For. Flora 451, Ind. Trees 566; Gamble Man. Ind. Timb. 604. Vern. Jiápútá, Pútijiá, Hind.

A handsome evergreen tree generally with pendent branches; branchlets slender, pubescent; bark dark-grey, almost smooth, marked with horizontal lines of white specks. Leaves alternate, 2-4 in. long, elliptic-oblong, acute or acuminate, serrulate, rarely entire, glabrous, shining, dark-green; main lateral nerves 8-10 pairs besides secondary nerves and reticulate veins; petiole '2-'3 in. long, pubescent; stipules subulate, deciduous. Flowers diœcious, small, yellow: Male short-pedicelled in axillary clusters which are often spicate;

Frmale long-pedicelled, axillary, solitary or in twos or threes. Calyx 3-5-cleft: segments imbricate. Stamens 3; filaments more or less connate. Ovary tomentose, 3-celled; styles 3; stigmas crescentshaped. Fruit a drupe, '5 in. long, obovoid or globose. whitetomentose; putamen very hard.

In moist shady mixed forests in the SIWALIK DIVISION, especially on the banks of the Suswá below Kánsráu; Khairi swamp, Rikhikesh, Gularparáo: Barkálá, Kasúmri, etc.

Wood light-grey, even-grained, shining, moderately hard, fairly durable; weight 50 lbs. per c. ft. Used for tools and turning. The leaves are used for cattle-fodder, and the nuts are strung up in rosaries and tied round children's neck to keep off disease, and also worn by women during pregnancy to prevent abortion.

New leaves in Apr. Fl. Apr., May. Fr. Cold season.

9. Cyclostemon, Bl.; G. P. n. 45.

1. C. assamicus, Hook. f.; Fl. Br. Ind. v. 342; Brandis Ind. Trees 567; Gamble Man. Ind. Timb. 607. Vern. Chipla, Dún : Khadbehúlá, Kumaun.

A very handsome small evergreen tree with smooth greenishgrey thin bark and slender branchlets. Leaves 3-5 in. long, ovate or elliptic-oblong, dark-green, quite glabrous and shining; margins entire but undulate; nerves 10-12 pairs, slender; petiole 2-3 in. Flowers axillary, diecious, apetalous, shortly pedicellate. Sepals usually 4, imbricate. MALE FLS.: Stamens about 12; filaments free. FEM. FLS.: Ovary generally 2-celled; stigmas sessile, fleshy, spreading. light-brown, liable to get chipped off in drying. Fruit a drupe 5 in. diam., brownish-grey-tomentose and chartaceous when young, but more or less distinctly lobed and bright scarlet when ripe: putamen hard, black; seeds albuminous.

Found in the Nakraunda and Mothronwála swamps, 1,900 ft., in the Dun, and identified as the above by Col. Prain.

The wood is greyish-white, moderately heavy, hard, tough and even-grained, with distinct rings; no heartwood. The leaves are eaten by cattle. The ripe fruit has a sweet mesocarp and is much eaten in Assam.

Fl. Nov., Dec. Fr. From Jan., probably ripening, as in Assam, in April.

10. Bischofia,* Blume; G. P. n. 53.

1. **B. javanica**, Bl.; Fl.Br. Ind. v. 345; Brandis For. Flora 446, Ind. Trees 558; Gamble Man. Ind. Timb. 607. Vern. *Pániala*, Western Dún; *Bhillár*, Málköt; *Kot Semlá*, *Káen*, Garhwal.

A large diœcious tree with a dark-brown bark exfoliating in angular scales. Leaves alternate, 3-foliolate, variable in size; common petiole 2-6 in. long. Leaflets 3-5, 1.5-3 in., ovate or ovate-oblong, acuminate, crenate; petiolule of lateral leaflets about '5 in. long. Inflorescence a much-branched terminal panicle. MALE FLS. minute; sepals 5, concave, obtuse, enclosing the stamens and opposite to them. Female fls, '2 in. diam.; sepals ovate, caducous. Ovary exserted, 3-celled, with two ovules in each cell; styles long, entire. Fruit a globose berry '5 in. diam., brown when fully ripe, supported on the thickened pedicels.

Shady ravines and in swampy localities in the Dún and Outer Himalaya: Karwapani, Lachiwala, Nakraunda, Khalri swamp, Kaluwala, Sansaru khala, Malkot Hills, etc.

Wood red, moderately hard, but rough-grained; heartwood of a darker colour, small. Weight 40-50 lbs. per c. ft. Little known in the Dún, but is used for all kinds of construction and for boat-building in other parts of India, notably in Eastern Bengal and Assam where it is also used for railway sleepers.

New leaves Feb., Mar. Fl. Apr., May. Fr. Cold season.

11. Daphniphyllum, Bl.; G. P. n. 57.

1. **D. himalayense**, Muell, Arg.; Fl. Br. Ind. v. 354; Brandis Ind. Trees 566; Gamble Man. Ind. Timb. 609. Vern. Ratendú, Jaunsar.

A small tree with stout trunk and branches. Leaves alternate, 6-8 in. long, linear-oblong or oblong-lanceolate, acute or acuminate, entire, glabrous and shining above, glaucous beneath; petiole 1.5-2 in. long. Flowers dieccious, apetalous in 3-4 in. long. axillary racemes. Sepals 3-8, small, deciduous in the female fl. Stamens 5; anthers apiculate. Ovary imperfectly 2-celled, cells 2-ovuled; atyles short or stigmas sessile, distinct, recurved. Fruit an oblong drupe, 5-6 in. long; seed with a membranous testa, albuminous and the stame of the stame of the second second seasons.

Found in shady ravines at and near Mussoorin, and in the OUTER HIMALAYAS, e.g., Málköt. Also in Jaunsar, 5,-7,000 ft.; Dárná, Mátkángrá, Baináná, etc.

Wood pale-brown, fine- and close-grained; pores minute; medullary rays numerous and fine; weight about 40 lbs. per c. ft.; wood of the roots is of a deep red colour and capable of being used for ornamental purposes.

Fl. Mar., Apr. Fr. June-Aug.

12. Antidesma, Linn.; G. P. n. 60.

1. A. diandrum, Roth; Fl. Br. Ind. v. 361; Brandis For. Flora 447, Ind. Trees 565; Gamble Man. Ind. Timb. 610. Vern. Amil, Imli, Káli Khatái, Dún.

A low shrub (or small tree?) with smooth grey bark and low spreading crown; branchlets rusty-tomentose. Leaves alternate, 2-5 by 1-2 in., ovate oblong or ovate-lanceolate, acute or acuminate, quite entire, glabrous and shining above, turning deep-red before falling; nerves faint, rusty-pubescent beneath; petiole 1 in., pubeacent; stipules lanceolate. Flowers dioxious, apetalous, greenish-yellow, very small, in slender terminal racemes. Calyx cup-shaped, 5-toothed. Stamens generally two, filaments free, as long as the pedicels; disk lobed. Ovary 1-celled; stigma bifid. Fruit a compressed drupe, 2 in. diam., of a pleasant acid taste and purplish-red when ripe.

Fairly common in Sál forests and on the outskirts of tappurs in the Don, up to 2,500 ft.; less so in the Sahábanpus Districe.

Wood pinkish-grey, hard, close-grained, weighing 41 lbs. per c. ft. The acid leaves are greedily eaten by coolies when thirsty, and are made into *chutni*. The fruit also is eaten.

New leaves Apr., May. Fl. May, June. Fr. Dec., Jan.

13. Jatropha, Linn.; G. P. n. 79.

1. J. Curcas, Linn.; Fl. Br. Ind. v. 383; Brandis Ind. Trees 576; Gamble Man. Ind. Timb. 613. Vern. Safed Arand, Hind.

A shrub or small tree with a short irregular trunk; young shoots glandular-tomentose, with an opaque saponaceous juice; bark gr.y, smooth, peeling off in thin papery flakes. Leaves 4-6 by 3-5 in., broadly cordate, usually palmately 5-lobed; petiole 3-9 in. long.

Flowers yellowish, monocious, in terminal or sub-terminal cymes. Sepals 5, imbricate, slightly puberulous, often coloured. Corolla tubular, pale-yellow, villous within; limb 5-lobed. Stamens 10, in two series; filaments of the inner series connate. Ovary 3-celled. Styles 3, glabrous. Fråt about 7 in. long, 3-lobed, oblong; seeds oblong, large, dark-brown, smooth; albumen oily.

Planted in hedge-rows in the Dun and Saharangur Districts and often growing wild as an escape. The juice of the twigs gives a scapy lather, believed to do good if applied on sores. The oil of the seeds is medicinal.

Fl. and Fr. throughout the year.

14. Trewia, Linn.; G. P. n. 144.

1. **T. nudiflora,** Linn.; Fl. Br. Ind. v 423; Brandis For. Flora 443, Ind. Trees 590; Gamble Man. Ind. Timb. 617. Vern. Gamhár (which is also the name for Gmelina arborea), Túmri, Dún; Dhaul-pedda (white tree), Sáháranpur.

A middle-sized deciduous tree with smooth grey bark. Leaves 6-9 by 4.5-7 in., cordate or broad-ovate, glabrous, 3-5 nerved at the base; petiole 2-4 in. long, terete. Flowers pale-green, in axillary racemes, appearing before the leaves: MALE in fascicles of 3-4, each supported by a bract, in lax interrupted racemes 4-9 in. long; female long-pedicellate, solitary or in few-flowered racemes. Calyx in the MALE FLS. globose, splitting into 3-4 concave segments; in the FEMALE FLS. of 3-5 imbricate sepals. Disk 0. Stamens free, numerous. Ovary cottony, 3-4-celled, cells 1-ovuled; styles connate at the base, about 1 in. long, covered with papillose stigmas throughout. Fruita berry, 1-13 in. diam., globose, depressed, smooth mesocarp not harder than potato.

Damp places and ravines in the SIWALIK DIVISION: Lachiwála, Nakraunda, Kálúwála, banks of the Jumná, Kánsráu and other Passes, etc.

Wood white, soft, fairly elastic, but not durable; weight 28-29 lbs. per c. ft. Used for country-made drums, and for yokes in Western Bengal.

Leafless Jan.- Mar. New leaves Mar., Apr. Fl. Feb.-Apr. Fr. Cold season.

15. Mallotus, Lour.; G. P. n. 146.

l. M. philippinensis, Muell. Arg.; Fl. Br. Ind. v. 442; Brandis For. Flora 444, Ind. Trees 590; Gamble M n. Ind.

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Timb. 619. Vern. Ráini, Dún; Kambel, Jaunsar; Rohni, Roini, Garhwal.

Generally a small evergreen tree, but occasionally up to 50 ft. high and 5 ft. in girth; bark thin, dark-grey, somewhat rough; young branches rusty. Leaves alternate, simple, very variable both in size and shape, usually 3-9 in long, ovate ovate-oblong or lanceolate, entire or, if of luxuriant coppice-shoots, closely toothed, glabious above, pubescent and with close-set red glands beneath, 3-nerved at the base; petiole about half the length of the blade, rusty-pubescent. Inflorescence and flowers brown or brick-red. Calya 3-cleft. Petals and disk none. Male Fls. clustered, anther-cells distinct and globose. Female Fls. solitary. Ovary 3-celled; cells 1-ovuled; styles 3, papillose inside. Fruit a 3-lobed capsule, 3-5 in. diam., globose, smooth, black.

Extremely common in the Dun and Saharanpur Forests and also up to 4,000 ft. in Jaunsar and Tehri-Garhwal.

Wood smooth, hard and close-grained; sapwood white; heartwood light-red to darker red towards the centro in large stems; used chiefly, as fuel. Annual rings indistinct; weight 48 lbs. per c. ft. The bark is sometimes used for tanning. The crimson powder, kamelá. which covers the ripe fruit, is used for dyeing silk, and also in medicine and Hindu religious ceremonies. The tree coppiess exceedingly well.

Fl. Sept.-Nov. Fr. Mar.-May.

16. Macaranga, Thouars; G. P. n. 148.

1. **M. indica,** Wight; Fl. Br. Ind. v. 446; Brandis Ind. Trees 592; Gamble Man. Ind. Timb. 621. Vern. *Pápri*, Málköt; *Rámálo*, Kumaun.

A middle-sized tree with thick glaucous branches and grey smooth bark. Leaves alternate, 6-12 by 5-10 in., deltoid-ovate, peltate, acuminate, entire or very obscurely and distantly toothed, thinly coriaceous, glabrate and closely yellow-punctate beneath; base rounded or truncate with two glands above; lateral nerves about 10 pairs above the petiole, the basal pair penniveined; petiole 4-12 in. long, glaucous; stipules 5 long, ovate, acuminate, recurved. Flowers diœcious, in axillary panieled racemes; bracts broad, concave. Stamens 6-8; anthers 4-celled. Ovary 1-celled. Style very short; stigma spurred. Capsule very small, covered with resinous points, crowned with the obliquely placed spurred stigma; seeds globose.

Only found in the Málköt Hills, Dehra Dớn, 4,-5,000 ft.: Sansárú and Láswáni Khálás.

Wood greyish-red, rather soft; pores large; medullary rays very fine, numerous; weight 33 lbs. per c. ft. Growth very fast.

Fl. Aug., Sept. Fr. Nov., Dec.

17. Sapium, P. Br.; G. P. n. 185.

Trees or shrubs. Leaves alternate, entire or toothed; petiole often with two glands at the top. Flowers in terminal racemes or spikes, monœcious, apetalous: MALES several in each bract; FEMALES at the base of the same racemes with male flowers, or in separate spikes, each in a bract. Disk none. Calyx 2-3-lobed or toothed or split to the base; sepals valvate. Stamens 2-3, filaments free; anther-cells distinct. Ovary 2-3-celled, with 1 ovule in each cell. Styles as many as the carpels, more or less connate at the base, undivided, spreading, stigmatose inside. Fruit a tardily dehiscent 3-valved capsule. Seeds globose; albumen fleshy.

Analysis of the Species.

Leaves rhomboid, entire; female flowers at the base of racemes of male flowers . 1. S. sebijerum. Leaves oblong-lanceolate, crenate; female flowers in separate spikes . . . 2. S. insigne.

1. **S. sebiferum**, Roxb.; Fl. Br. Ind. v. 470; Brandis Ind. Trees 584; Gamble Man. Ind. Timb. 624. Syn.—Excacaria sebifera, Muell. Arg.; Brandis For. Flora 441. The Chinese Tallowtree. Vern. Tár-charbi, Dún; Pahári Shisham, Saháranpur.

A small gnarled tree. Leaves 2-3 in. long, rhomboid or broad-ovate, sometimes broader than long, acuminate, entire. membranous, glaucous beneath, somewhat resembling the leaflets of Sissu; petiole flexible, nearly as long as the blade, with 2 glands at the top. Flowers greenish-yellow, monœcious, in terminal racemes 2-4 in. long: FEMALE FLOWERS few, stoutly pedicelled, at the base of racemes bearing male flowers above, the male portion being caducous: MALE

FLOWERS at the end of racemes of the above kind, or forming racemes entirely of their own which appear generally before the female or androgynous racemes. Calyx truncate. Anthers 2-3, large, exserted. Ovary glabrous; styles 3, connate at the base; stigmas recurved. Capsules sub-globose, glaucous, '4-'5 in. diam. Seeds 3, enclosed in a white fatty arillus.

Growing wild everywhere in the Dún, but rather rare in the Saháranpur District. It is generally planted in avenues.

The wood is even-grained, light, soft or moderately hard; weight 32 lbs. per c. ft. The tallow of the seeds is separated by boiling in water, and is made into candles in China and Japan, where the tree is indigenous. The seeds give an oil, and the leaves a black dye.

Leafless Feb.-Apr. Fl. June-Aug. Fr. Oct.-Dec.

2. **S. insigne**, Benth.; Fl. Br. Ind. v. 471; Brandis Ind. Trees 585; Gamble Man. Ind. Timb. 625. Syn.—Excæcaria insignis, Muell. Arg.; Brandis For. Flora 442. Vern. Khinná, Khinná, Khinni, Dún and Garhwal.

A middle-sized deciduous tree with grey corky bark and thick milky juice. Leaves 6-12 in. long, elliptic or oblong-lanceolate, acuminate, crenate-serrate, soft, glabrous; lateral nerves slender, 12-20 pairs; petiole 1-2 in. long, with a pair of glands near the apex. Flowers in long fleshy terminal spikes: MALE in circular clusters subtended by two fleshy ovate acute green bracts; calyx membranous, lobes 2, rounded; stamens 2: FEMALE shortly pedicelled; sepals ovate; stigmas short. Fruit an ovoid capsule 3 in. long, closely packed on a fleshy spike; seeds with an oily albumen.

Foot of the Himalaya and hot valleys up to 4,000 ft. Common at Tháno, Kálimatti, Ráipur, Sahansra-dhárá, Saiá, etc.

Wood white, very soft, spongy and very light, weighing about 25 lbs. per c. ft. It is used for cylinders of Indian drums. The milk is acrid and is said to be poisonous. It is often planted in hedges.

Leafless Dec.-Apr. Fr. Cold season. Fr. May, June.

Other plants of the Family that may be mentioned are:—

1. Andrachne cordifolia, Muell. Arg.; Fl. Br. Ind. v. 283. Vern. Bharti, Bhartoi. Jaunsar. A small shrub with slender branches. Leaves 1-2 in long, ovate-oblong, obtuse, hairy beneath; petiole filiform, of various lengths. Flowers monœcious, on long filiform axillary pedicels. Capsule globose, 3 in. diam. Wood white and close-grained. Jaunsar and Tehri-Garhwal, up to 8,000 ft.; Mundáli, Konáin, etc. Fl. Rainy season.—G. P. n. 30.

- 2. Ricinus communis, Linn.; Fl. Br. Ind. v. 457. The Castoroil plant. Vern. Erandi, Arandi, Hind.—An evergreen shrub; cultivated and run wild in villages. Leaves 1-2 ft. diam., palmately lobed, serrate, membranous, glaucous beneath, long-petiolate; stem and petiole hollow. Flowers monœcious, the male being above the female in the same panicle. Stamens numerous. Ovary 3-celled; styles spreading, feathery. Fruit a globose capsule, generally echinate, '5-1 in. long; seeds oblong, mottled, with fleshy albumen. The Eri silkworm is reared on its leaves. Besides the well-known oil, many parts of the plant are used in medicine.—G. P. n. 149.
- 3. Baliospermum axillare, Bl.; Fl. Br. Ind. v. 461. A stout undershrub, fairly common in shady places in the Dún: Lachiwála, Kálsi, etc. Leaves very variable, upper 2-3 in. long and lanceolate, lower 6-10 in. long, oblong or palmately lobed, 3-5-nerved at the base, rigidly coriaceous; petiole stout, of various lengths. Flowers small in interrupted racemes from the axils of the upper leaves. Capsule 3-5 in. long, 3-lobed. Fl. & fr. throughout the year.—G. P. n. 160.

Order 6.—URTICALES.

FAM. 71. URTICACEÆ G. P. N. 153.

Herbs, shrubs or trees, often with milky sap. Leaves usually alternate, simple, stipulate, generally stellately hirsute. Flowers mostly 1-sexual, monœcious or diœcious, small, in heads cymes or spikes or inside a hollow receptacle. Perianth simple, or of 3-5 free or connate segments. Stamens usually as many as perianth-segments and opposite to them, often inflexed in bud with reversed anthers. Ovary free, 1-celled, 1-ovuled; style simple or 2-fid, often eccentric; stigma armed or feathery. Fruit a samara, a drupe, a nut or an achene, the last often in variously shaped receptacles.

This Family may be divided into the following Tribes:—

- I. ULMEE.—Flowers 2-sexual; stamens not inflected; style 2-fid; ovule suspended; fruit a samara.—Ulmus, Holoptelea.
- II. Celtide E.—Flowers polygamous; stamens inflected in bud; style 2-fid; ovule suspended; fruit a drupe.— Celtis, Trema.
- III. Mober.—Flowers 1-sexual, in spikes or heads; stamens inflected; style generally 2-fid; ovule suspended; fruit usually compound.—Streblus, Plecospermum, Morus. Browsonetia.
- IV. ARTOCARPEE.—Flowers 1-sexual, inside or around a fleshy receptacle; stamens not inflected; style simple; ovule suspended; sap milky.—Ficus, Cudrania, Artocarpus.
- V. URTICEE.—Flowers 1-sexual, usually in heads or clusters stamens inflected; style simple; ovule erect; fruit a simple achene.—Bæhmeria, Pouzolzia, Villebrunea, Debregeasia, Maoutia, Girardinia.

Analysis of the Genera.

I. ULMEÆ.

Leaves serrate; lateral nerves many, straight;
wing of samara continuous . . . 1. Ulmus.

Leaves entire; lateral nerves few, arcuate;
wing of samara cleft at the tip . . 2. Holoptelea.

II. CELTIDEÆ.

Lvs. 3-nerved, smooth; male sepals imbricate 3. Celtis. Lvs. 3-nerved, scabrous; male sepals valvate 4. Trema.

III. MOREÆ.

Unarmed trees.

Flowers in spikes; fruit compound, fleshy
Flowers fascicled or solitary; fruit a
1 seeded berry

Armed shrubs (flowers in heads; fruit a 1-2seeded compound berry)

6. PLECOSPERMUM.

IV. ARTOCARPEÆ.

Leaves penni- or 3-nerved; fruit a hollow receptacle with free achenes inside Leaves penninerved; fruit a many-seeded	8. Frous.
compound berry	9. Cudrania.
V. URTICEÆ.	I .
Fruiting perianth dry or membranous.	
Flower-heads in interrupted spikes	10. BŒHMERIA.
Flower-heads in sessile axillary clusters .	11. Pouzolzia.
Fruiting perianth fleshy.	
Leaves broad	12. VILLEBRUNEA!
	13. Debregeasia.
Fruiting perianth none; flower-heads cymose	14. MAOUTIA.

I. ULMEÆ.

1. Ulmus, Linn.; G. P. n. 1.

1. **U. Wallichiana**, Planch.; Fl. Br. Ind. v. 480; Brandis For. Flora 432, Ind. Trees 594; Gamble Man. Ind. Timb. 627. The Himalayan Elm. Vern. Emroi, Imroi, Jaunsar.

A large deciduous tree with rough grey bark exfoliating in diamond-shaped scales; young branches pubescent. Leaves alternate, 2-6 in. long, elliptic-ovate or obovate, long-acuminate, doubly serrate, scabrous or smooth above, pubescent beneath; nerves 15-20 pairs, straight, each terminating in a large serrature, axils of nerves usually villous; base unequal; petiole '3-5 in. long; stipules subulate, membranous. Flowers 2-sexual, in dense lateral racemes, appearing before the leaves from the leaf-scars of last year's shoots; pedicels '2 in., fascicled, jointed a little below the middle, pubescent below the joint. Perianth turbinate, glabrous, persistent; lobes 5-6, ciliate. Stamens as many as the perianth-lobes, not inflected in bud. Ovary compressed, stipitate; style 2-fid, inner side stigmatose to the base. Fruit a flat stipitate samara, '6-'7 in. long, with an ovate or obovate membranous reticulate wing completely surrounding the seed.

Jaunsar and Tehri-Garhwal, between 3,500 and 10,000 ft., generally in ravines, fairly common: Mohna Block, Konáin, Dhará-gádh, Bálchá, Kúlni, etc.

Heartwood greyish-brown, fine-grained, moderately hard, with a very beautiful silver-grain, capable of a fine polish. The bark

contains a strong fibre which is made into cordage, sandals and slow matches. The leaves are much prized as cattle-fodder, for which reason the tree is planted about villages.

New leaves Apr., May. Fl. Mar., Apr. Fr. May, June.

2. Holoptelea, Planch.; G. P. n. 2.

1. **H. integrifolia**, Planch.; Fl.Br. Ind. v. 481; Brandis Ind. Trees 595, Gamble Man. Ind. Timb. 628. Syn.—Ulmus integrifolia, Roxb.; Brandis For. Flora 431. Vern. Pápri, Káli Pápri, Banchillá, Saháranpur.

A large deciduous tree; bark grey or light-brown, with an offensive smell when freshly cut, marked with tubercles on branches. Leaves alternate, 3-6 by 2-3 in., elliptic or broad-oblong, acuminate, entire, coriaceous, glabrous or pubescent beneath; nerves 5-8 pairs; arcuate; base rounded or acute, rarely cordate or oblique; petiole 2-3 in. long; stipules ovate, membranous. Inflorescence as in Ulmus Wallichiana; fascicles fewer-flowered. Perianth cleft to the base; segments pubescent. Stamens 8 in male fls., 5 in 2-sexual fls.; anthers hairy. Ovary long-stipitate. Fruit an oval or orbicular samara 1 in. long, generally chartaceous, cleft at the tip, often crowned with the remains of the style.

Common throughout the Saháranpur District; also found in a few places in the Dún, and at low elevations in Jaunsar, e.g., Khairi swamp, Barkōt, Tháno, Kálimatti, Kálsi, etc.

Wood yellowish-grey, moderately hard; pores small and uniformly distributed; heartwood and annual rings not distinct; weight 40 lbs. per c. ft. The wood is used for building, carts and carving. The leaves, which have an unpleasant smell, are hopped for cattlefolder. An oil can be extracted from the seeds.

Leafless Feb., Mar. Fl. while leafless. Fr. May-Aug., remaining long on the tree.

II. CELTIDEÆ.

3. Celtis, Linn.; G. P. n. 7.

- 1. **C. australis**, Linn.; Fl. Br. Ind. v. 482; Brandis For. Flora 428, Ind. Trees 595; Gamble Man. Ind. Timb. 529. Vern. Kharik, Kharak, Jaunsar and Garhwal; Kharak-chená, Dún.
- A middle-sized deciduous tree; bark bluish-grey or brown, often with whitish specks, larger trees with narrow horizontal

wrinkles; branchlets drooping. Leaves alternate, 3-5 in. long, obliquely ovate or ovate-lanceolate, long-acuminate, entire towards the base, coriaceous and tough when full-grown, dark green and glabrous above, with 3 strong basal nerves, midrib penniveined; base acute or rounded, sometimes oblique; petiole 3-5 in. long; stipules subulate, caducous. Flowers polygamous, 4-5-merous, male and 2-sexual on short capillary pedicels at the base of the shoots; female long-pedicelled and axillary. Sexuls 4-5, oblong, impricate, deciduous, with woolly margins. Stamens 4-5, short. Ovary sessile, woolly. Fruit an ovoid drupe, 3 in. long, more or less reticulately rugose; peduncle 5-2 in. long.

Fairly common between 4,000 and 8,500 ft. in JAUNSAB and TEHRI-GARHWAL, especially about villages where it is planted for shade and fodder; very numerous at Bámsu and Kúlni. Also in many places in the Dún, both planted and self-grown, e.g., Nak-

raunda, Haráwála, Mothronwála, Karwápáni, etc.

Wood yellowish-grey with irregular streaks of darker colour; annual rings distinct; weight 47 lbs. per c. ft. It is tough and strong, and is used for oars, whip-handles, churn-sticks and other purposes. The leaves are lopped for fodder.

New leaves and fl. Mar.-May. Fr. June-Sept.

4. Trema, Lour.; G. P. n. 9.

Shrubs or trees. Leaves alternate, generally 3-nerved; stipules caducous. Flowers very small, monœcious, in axillary cymes. Sepals 4-5, induplicately valvate in the male fls., subimbricate in the female. Stamens 5, longer than the sepals. Ovary sessile; style 2-fid, arms linear. Fruit a small drupe, supported by the persistent perianth and crowned by the arms of the style.

Analysis of the Species.

Leaves broad, soft, tomentose beneath . 1. T. orientalisi Leaves narrow, hard, rough on both surfaces 2. T. politoria.

1. T. orientalis, Bl.; Fl. Br. Ind. v. 484; Brandis Ind. Trees 507; Gamble Man. Ind. Timb. 630. Syn.—Sponia orientalis, Planch.; Brandis For. Flora 430, The Charcoal Tree. Vern. Jiban, Bengal.

A small rapidly-growing and short-lived tree; bark thin, greyish or bluish-green, smooth, but with numerous lenticels. Leaves 3-6 by 2-3-5 in., ovate or ovate-oblong, acu minate, crenate-serrulate, membranous, scabrid above, soft-tomentose beneath; base 3-7-nerved, cordate, lateral nerves 3-4 pairs above the basal; petiole 3-4 in. Cymes lax, spreading. Drupes 15 in. long, ovoid, black when ripe.

Gulargháti, Nakraunda and other swampy places in the Dún; fairly common, but is apt to be mistaken for Grewia layigata.

Wood light-reddish-grey, light and soft; weight 28 lbs. per c. ft. The bark gives a strong fibre, and the leaves are lopped for fodder.

Fl. Feb.-Apr. Fr. June-Aug.

2. **T. politoria**, Planch.; Fl. Br. Ind. v. 484; Brandis Ind. Trees 597; Gamble Man. Ind. Timb. 631. Syn.—Sponia politoria Planch.; Brandis For. Flora 430. Vern. Khágshi, Khákshi, Kúri, Dún; Khardál, Saháranpur.

A shrub or small tree with smooth bark and scabrid branches. Leaves 2-5 by 3-2 in., oblong or ovate-lanceolate, acuminate, serrulate, subcoriaceous, very hard and scabrid on both surfaces, darkgreen and shining above, paler beneath, trinerved at the base, lateral nerves 6-8 pairs, arouate, depressed above; base nearly equal, rounded or cordate: petiole 2-4 in. Cymes compact, generally not exceeding the petiole. Drupes 1-15 in. diam., globose.

Common in the SIWALIK DIVISION, along rau and river banks and in abandoned fields. Comes up freely on landslips as in the SAHARANPUR SIWALIKS, where it is very valuable for binding the soil.

Wood white, moderately hard. Growth very fast, only 2 rings per inch of radius. Weight 36 lbs. per c. ft. The bark gives a strong fibre used for making ropes. The leaves are lopped for fodder and are used like sandpaper to polish wood and horn.

Now leaves Mar., Apr. Fl. Apr.-June. Fr. Oct., Nov.

III. MOREÆ.

5. Streblus, Lour.; G. P. n. 21.

1. **S. asper,** Lour.; Fl. Br. Ind. v. 489; Brandis For. Flora 410, Ind. Trees 615; Gamble Man. Ind. Timb. 632. Vern. Dahiá Kurchná, Saháranpur.

A small evergreen tree with milky juice; bark light-grey, irregularly ribbed. Leaves alternate, 2-4 in long, elliptic rhomboid or obovate, irregularly toothed, acute or obtuse, coriaceous, scabrid with

minute raised dots; base cuneate; petiole '08-'1 in. long, pubescent; stipules lanceolate. Flowers generally diœcious. Male fls. in short-peduncled heads or spikes; sepals 4, imbricate; stamens 4, inflexed in bud; heads sometimes androgynous. Female fls. pedunculate, soil tary or a few together in the axils of leaves; peduncle slender, '6-'8 in. long; sepals 4, concave, embracing the ovary, enlarged in fruit; style contral, bifid, with long spreading arms. Fruit a 1-seeded globose berry, '2 in. long, yellow when ripe.

Common in the Saháranpur District, especially towards the Jumná; often planted in hedgerows: Roshanpur, Shúfipur, Kásimpur, Ránipur, etc.

Wood white, moderately hard, tough and elastic; weight 40 lbs. per c. ft.; no heartwood. It is much sought after in Bengal for making yokes. The twigs are used as tooth brushes, and the rough leaves to polish wood and ivory. The milky juice is medicinal. The fruit is eaten when ripe.

New leaves Mar. Fl. Jan.-Mar. Fr. May-July.

6. Plecospermum, Trecul; G. P. n. 26.

1. **P. spinosum**, Treeul; Fl. Br. Ind. v. 491; Brandis For. Flora 401, Ind. Trees 615, Gamble Man. Ind. Timb. 634.

A large thorny shrub, closely resembling Cudrania javanensis in habit and foliage; spines axillary, straight, stout; bark lightbrown or orange. Leaves alternate, 2-3 in. long, elliptic-oblong or obovate, obtuse or acute, quite entire, glabrous, penniveined; petiole 3-5in. long. Flouers diœcious, in axillary pedunculate heads: head solitary or 2-3 together. Male heads '2-3 in. diam.; sepuls 4, obtuse, imbricate, hairy outside, emarginate and ciliate at the tips; stamens 4, inflexed in bud, afterwards exserted. Female heads smaller than male heads in flower, afterwards '5 in. diam., pubescent; perianth gamophyllous, with a 4-toothed mouth, connate into a globose head; style simple, filiform, much exserted, hairy; stigma papillose. Fruit a 1-2-seeded irregularly shaped berry, '5 in. diam., rather smooth, velvety outside.

Believed to occur in the Dun, but has not yet (Sept. 1907) been satisfactorily localised.

Sapwood white; heartwood small, bright-orange, very hard, with a yellow resin; weight 50 lbs. per c. ft. A yellow dye is extracted from the wood in the Darjeeling Terai.

Fl. Feb.-Apr.

7. Morus, Linn.; G. P. n. 33.

The Mulherries.

Trees or shrubs. Leaves alternate, serrate; base 3-nerved; stipules small, caducous. Flowers unisexual, in spikes. Male fls.: Sepals 4, imbricate. Stamens 4, inflexed in bud, opposite to and longer than the sepals. Pistillode small. Female fls.: Sepals 4, imbricate, accrescent and succulent in fruit. Ovary 1-celled, straight; style central, 2-fid. Fruit a compound berry, the perianths coalescing to form a gelatinous pericarp.

Analysis of the Species.

 M. alba, Linn.; Fl. Br. Ind. v. 492; Brandis For. Flora 407, Ind. Trees 61?; Gamble Man. Ind. Timb. 634. Vern. Tútri, Túntri, Dún!; Tút, Túnt, Hind.

A middle-sized deciduous tree with pubescent shoots. Leaves 2-3 in. long, ovate to lenceolate, acute or acuminate, dentate or serrate, sometimes lobed, membranous, glabrous above, slightly pubescent along the midrib and nerves beneath; base 3-nerved, rounded or truncate, sometimes cordate; petiole '5-1'3 in. long, slender. Flowers monœcious. Female spikes short, ovoid, pedunculate; styles short. Fruit '3-'5 in. long, white or tinged with pink; peduncle '5-'7 in. long, slender.

Cultivated or run wild in the Dún. Planted in avenues along the Dehra—Rámpur-Mandi Road.

The wood is fine and close-grained, and is used for building boats, furniture and agricultural implements; weight 36-56 lbs. per

c. ft. Silk-worms are fed on its leaves, and the fruit is eaten, that of some varieties being excellent.

New leaves and fl. Mar., Apr. Fr. May, June, or later.

2. M. serrata, Roxb.; Fl. Br. Ind. v. 492; Brandis For. Flora 409, Ind. Trees 612; Gamble Man. Ind. Timb. 635. Vern. Kimú, Jaunsar; Himú, also Tú: or Túnt. Dún.

A large deciduous tree with scaly buds; bark reddish- or greyish-brown, generally smooth and lenticellate on branches, exfoliating on old stems; young shoots pubescent. Leaves 2-8 by 1-5-6 in., broad-ovate, generally cordate, toothed or serrate (sometimes doubly), often 3-lobed, shortly caudate-acuminate, membranous, slightly pubescent or glabrous above, thickly grey-tomentose beneath, 3-nerved at the base; petiole 1-1-7 in., tomentose. Flowers diœcious. Male spikes 1-2 in. Female spikes 5-7 in. long; styles very hairy. Fruit 7-1 in. long, mucilaginous, purple; peduncle 1-2 in. long, stout, hairy.

Cultivated'and wild in Jaunsar and Tehri-Garhwal, 4,-9,000 ft.; also in the Dún, e.g., at Kálúwála. Common at Mussoorie.

Sapwood small, white; heartwood yellow or brown, moderately hard, fine-grained; weight about 35 lbs. per c. ft. It works and seasons well and takes a fine polish. It is used for cabinet-work and agricultural implements. The leaves are used as cattle-fodder. The fruit is sweet, and is eaten.

New leaves and fl. in Apr., May. Fr. June-Aug.

3. M. indica, Linn.; Fl. Br. Ind. v. 492; Brandis For. Flora 408, Ind. Trees 612; Gamble Man. Ind. Timb. 635. Vern. Siá Tút or Siá Tút, Hind.

A moderate-sized deciduous tree with reddish- or yellowish-brown smooth bark marked with long horizontal lenticels. Leaves 2-5 by 1-3 in., ovate, caudate-acuminate, sharply serrate, often lobed, membranous, pubescent when young, scabrous when mature, 3-nerved at the base; petiole '5 to 1'5 in. long, sparsely hairy. Flovers monoscious. Female spikes '3-'5 in. long, ovoid; styles long, hairy. Fruit small, black when ripe; peduncle '1-'2 in. long, very slender.

Some botanists consider this a form of M. alba.

Not uncommon in the Dun and Saharanpur Districts and also in the Punjab (Shahdara and Changa Manga Plantations).

Wood yellow when fresh-cut, turning brown and mottled afterwards, rather hard; weight about 45 lbs. per c. ft.; growth very fast

in favourable localities. Often cultivated for its leaves, which are used to feed silkworms.

New leaves and fl., Feb., Mar. Fr. May.

Broussonetia papyrifera, Vent.; Fl. Br. Ind. v. 490; the Paper Mulberry,—was first introduced in the Kaunli garden at Dehra, whence it has spread, and is now found self-grown in many places. Leaves 5-9 in. long, obliquely ovate, acuminate, often lobed, membranous, tomentose; petiole 2-4 in. long. Flowers in heads. Wood very soft and light. The bark gives a fine fibre which is made into paper in Japan.—G. P. n. 24.

IV. ARTOCARPEÆ.

8. Ficus, Linn.; G. P. n. 39.

The Figs.

Trees or shrubs with milky sap. Leaves alternate (opposite in F. hispida and sæmocarpa), entire toothed or lobed; stipules deciduous. Flowers minute, unisexual, on the inner surface of a fleshy hollow receptacle which has an aperture at the apex partly closed by imbricate bracts, often mixed with bracteoles. Male Fls.: Perianth thin, 2-6-partite, imbricate. Stamens 1-2; anthers of 2 distinct cells. Female fls.: Perianth as in the male, or none. Style eccentric; ovule pendulous. Achenes crustaceous or fleshy. Receptacles bracteate, 1-sexual or androgynous, with the male flowers near the mouth.

Note.—Besides the male and female, two other kinds,—gall and neuter flowers,—are sometimes found in the receptacles. The gall flowers are females with shorter styles and with the ovary occupied by the pupa of a Hymenopterous insect (Gall-insect). The neuter flowers, which only occur in one or two species not found in India proper, have the perianth of the males, but no stamens. In the same receptacle there may be males and females, or males, females and galls, or males and galls, or females and neuters, or only females.

Analysis of the Species.

J	
A. Epiphytic in early life. Receptacles ax except in 1 and 3.	illary, in pairs, sessile
Petiole not jointed to the blade, and less than \(\frac{1}{4} \) its length. Lvs. thinly coriaceous, often up to three times as long as broad. Lvs. and branchlets scaberulous; stipules as long as the petiole. Lvs. and branchlets smooth; stipules scarcely \(\frac{1}{4} \) the length of the	1. F. gibbosa.
petiole	3. F. glaberrima.
Lvs. thickly coriaceous, scarcely twice as long as broad. Lvs. large; nerves distinct, reticulate. Lvs. small; nerves faint, parallel Petiole jointed to the blade, and usually	2. F. bengalensis. 4. F. retusa.
equal to at least half its length. Leaves broad, caudate acuminate; ripe fruit black. Acumen short; petiole channelled or flattened above Acumen long; petiole quite terete. Leaves narrow, abruptly acuminate;	5. F. Rumphii.6. F. religiosa.
ripe fruit white	7. F. infectoria.
B. Not epiphytic in early life. Receptacles axillary, solitary except in 16, peduncled.	
Erect shrubs or small trees.	
Leaves narrow, abruptly long-acumin- ate, hard, distantly toothed Leaves narrow, gradually acuminate,	9. F. clavata.
soft, quite entire	16. F. nemoralis.
Leaves broad, acute, closely dentate or crenate	15. F. palmata,
Scandent or prostrate shrubs.	-
Leaves and fruit very rough Leaves and fruit more or less smooth.	8. F. heterophylla.
Leaves subacute, coriaceous; recep-	19 F comdons
tacles small Leaves long-acuminate, membranous;	13. F. scandens.
receptacles large	14. F. foveolata.

C. Never epiphytic: receptacles generally on leafless racemose branches (axillary on young plants of 10 and 11).

Leaves opposite.

A small tree : leaves broad

. . 10. F. hispida.

A small prostrate shrub ; leaves narrow 11. F. sæmocarpa.

Leaves alternate.

Leaves unequal-sided: petiole very

12. F. Cunia.

Leaves symmetrical; petiole usually

17. F. Roxburghii.

A small tree; leaves large, hard, subcoriaceous A large tree; leaves small, soft,

18. F. glomerata.

membranous

1. F. gibbosa, Bl.; Fl. Br. Ind. v. 496; King Fic. 4, t. 2; Brandis Ind. Trees 599; Gamble Man. Ind. Timb. 637. Syn.-F. parasitica, Konig: Brandis For, Flora 420. Vern. Chhánchri, Dún and Garhwal: Dádu Bándá, Dún.

A much-branched small evergreen tree, epiphytic in early life; bark thin, brownish-grey. Leaves alternate, 2.5-4.5 by 1-2 in., ellipticoblong, acute at both ends, entire, subcoriaceous, generally smooth above, always more or less scaberulous beneath, somewhat oblique and 3-nerved at the base; lateral nerves 4-6 pairs, prominent beneath, arcuate, joining within the margins; petiole 2-4 in. long; stipules ovate-lanceolate, convolute, generally as long as the petiole. MALE FLS. : sepals 4-6, linear, fleshy, hairy; stamen 1; pistil abortive. GALL FLS.: sepals of the male : style short. FEM. FLS. in separate receptacles : sepals 4, hyaline; style elongate. Receptacles '2-'3 in. across, solitary or in pairs, pyriform-globose, scabrid and mammillate. vellow when ripe; basal bracts 0; peduncle 2-3 in. long, bracteate at the base.

Very common in the Dun as an epiphyte generally on large old trees, notably Pipal and Haldú: Káluwála, Lachiwála, Dúdhli. Phándowála, etc. Occasionally in the Saháranpur District.

The leaves are very good for cattle-fodder, and are said to increase the flow of milk in milch cows.

Fr. ripens Jan.-Mar.

Two varieties of this species occur in the SIWALIK DIVISION.

1. Var. parasitica, sp. Koenig. Leaves broad, nearly rhomboid, more or less scabrid on both surfaces.

- 2. Var. tuberculata, sp. Roxb. Leaves narrower and smaller, generally smooth above, sometimes (but not in the Dún specimens) irregularly serrate.
- 2. **F. bengalensis**, Linn.; Fl. Br. Ind. v. 499; King Fic. 18, t. 13.; Brandis For. Flora 412, Ind. Trees 600; Gamble Man. Ind. Timb. 638. The Banyan tree. Vern. Bar, Bargat, Hind.

A large evergreen tree throwing down numerous aërial roots from the branches which are mostly horizontal; bark greyish-white, smooth, exfoliating in irregular flakes; young parts softly pubescent. Leaves alternate, 4-8 by 2-5 in., ovate or elliptic, entire, obtuse, subcordate or rounded at the base, thickly coriaceous, glabrescent above, with 3-7 basal nerves and 4-6 pairs of main lateral nerves; petiole 1-2 in. long, stout; stipules '7-1 in. long, coriaceous, sheathing. MALE FLS. crowded near the mouth of the receptacle; sepals 4; stamen 1. FEMALE FLS. with a shorter perianth; style long; male and female in the same receptacle. Receptacles '5 in. diam., in axillary pairs, sessile, globose, puberulous, red when ripe, supported on 3 broad coriaceous basal bracts.

Fairly common in the Sál forests of the Dún and along the foot of the Siwaliks in the Saháranpur District. Much planted in villages and in avenues throughout India. Assisted by the aërial roots which serve as supports for the branches and also as feeders the crown spreads enormously when the tree grows out in the open. Trees with crowns 200 to 300 ft. in. diam. are not uncommon, while the girth often attains 25 to 30 ft., and the height 80 to 90 ft.

Wood grey, moderately hard, appearing as composed of thin plates on a cross section; no heartwood; weight about 40 lbs. per c. ft. It is durable under water, and is therefore used for well-curbs. The wood of the drops is tough and elastic, and is used for tent-poles, cart-yokes and carrying-poles. The milky juice is made into bird-lime. The leaves and twigs are a favourite fodder for cattle and elephants; the former are also used as plates. Lac is sometimes collected on the tree. The fruit is eaten in times of scarcity and is greedily devoured by birds and monkeys. The tree is easily propagated by cuttings. It is, however, a nuisance in forests where it takes too much space, and its dense shade makes it impossible for any other trees to grow under it. In the Don Forests the Haldú seems to be the most favourite host for the epiphytic Banyan.

New leaves Mar., Apr. Fr. ripens Apr., May.

Allied to this is the India-rubber tree, F. elastica, Roxb.; Fl. Br. Ind. v. 508; King Fic. 45, t. 54;—a native of Assam and Burma, successfully cultivated in Dehba and Sahāranpur. It is a hand-some evergreen tree, exceedingly suitable for avenues. Leaves darkgreen, glossy; lateral nerves numerous, straight and parallel; stipules

long, lanceolate, coloured and amplexicaul. Receptacles '5 in. long, ovate-oblong.

3. F. glaberrima, Bl.; Fl. Br. Ind. v. 506; King Fic. 37, t. 43; Brandis Ind. Trees 600; Gamble Man. Ind. Timb. 640. Vern. Kákhri, Khánkri, Durlá, Hind.

A tall trce, epiphytic in early life; bark thin, dark-grey, smooth. Leaves alternate, 4-6 by 1·5·2 in., oblong ovate-lanceolate or elliptic, shortly blunt-acuminate, entire, sub-coriaceous, glabrous and shining above, minutely pubescent or glabrescent beneath; main lateral nerves 8-10 pairs, rather horizontal, arcuate, joining within the margins; base subacute or slightly rounded, 3-nerved; petiole ·5·1·2 in. long; stipules linear-lanceolate, ·4··75 in. long, glabrous. Male Fls. few, near the mouth of the receptacle; sepals 4, lanceolate; stamen 1, filament short. Gall Fls.: perianth 4-cleft. Fem. Fls.: perianth 0. Receptacles ·2··3 in. across, in axillary pairs, globose, slightly verrucose when young, smooth and orange-coloured when ripe; peduncle about half the length of the subtending petiole; basal bracts 3, broad, minute, deciduous.

Swampy localities in the Dún, e. g., Nakraunda and Mothron-wala, and along streams in shady ravines at low elevations in the HILLS, e. g., Tons bank near Kálsi. Also in the Sansárú Khálá, MÁLKÖT.

The leaves and tender young shoots are lopped for fodder. Fr. ripens Feb., Mar.

4. **F. retusa**, Linn. var. nitida, Thunb.; Fl. Br. Ind. v. 511. King Fic. 50, t. 62; Brandis For. Flora 417, Ind. Trees 603; Gamble Man. Ind. Timb. 643. Of all the Figs described in this book, it resembles *F. elastica* most closely, from which, however, it differs in having smaller leaves and subglobose receptacles. The flowers also are different.

A large evergreen tree; bark dark-grey, smooth, with transverse lines of lenticel bars. Leaves alternate, 2-4 by 1·3-2·5 in., ovate elliptic or rhomboid, acute or short-acuminate, entire, coriacous glabrous and shining; lateral nerves numerous, slender; base 3-nerved, narrowed into the petiole which is 3·5 in. long; stipules lanceolate, about '5 in. long.: Male fis. numerous; sepals 3, oblanceolate; stamen 1. Gall fis.: sepals 3, spathulate. Fem. fis.: perianth very small; ovary smooth; style short. Receptacles about '2 in. diam., in axillary pairs, sessile, subglobose, yellowish when ripe; basal bracts broad-ovate, persistent.

Only a few indigenous-looking trees in the Buláwála Pass in the Siwaliks behind the crest; elevation 3,000 ft. Cultivated at Denra Dún and Saráranpur.

Wood light reddish-grey, moderately hard, very prettily mottled, but used chiefly for fuel; weight about 40 lbs. per c. ft. The leaves are used for elephant-fodder. Evergreen and umbrageous, it makes an excellent avenue tree.

Fr. Feb., Apr.

5. **F. Rumphii**, Bl.; Fl. Br. Ind. v. 512; King Fic. 54, t. 67B; Brandis Ind. Trees 601; Gamble Man. Ind. Timb. 644. Syn.—F. cordifolia, Roxb.; Brandis For. Flora 416. Vern. Pilkhan, Khabar, Hind.; Pilkhoi, Jaunsar.

A large deciduous tree; bark yellowish-grey, smooth, on older stems exfoliating in hard scurfy scales. Leaves alternate, 4-6 in. long, broad-ovate or ovate-oblong, acuminate, quite glabrous, shining above; acumen never exceeding an inch, often quite short; margins entire, undulate; lateral nerves 3-6 pairs; base shallow cordate, truncate, rounded or narrowed towards the petiole, 3-5-nerved; petiole 2-3-5 in., channelled or flattened above, jointed to the blade. Male fls. few near the mouth of the receptacles; sepals 3; stamen 1. Female and Gall fls.: sepals 3; lanceolate; ovary ovoid, smooth; style elongate. Achenes mucilaginous. Receptacles 5 in. across, globose, sessile, in axillary pairs, black when ripe; basal bracts 3. orbicular.

Common in the Dun and Saharanpur Forests, and also in the Tons and Jumna Valleys in Jaunsar and Tehri-Garhwal.

Wood very soft, spongy, pinkish-white, mottled on a radial section; weight 27 lbs. per c. ft. Lac insects are reared on it in Assam. The leaves and branches are lopped for cattle- and elephant-fodder, and the fruit is eaten. Often planted in avenues, but is a destructive epiphyte in forests.

New leaves in Mar. Fr. ripens May, June.

Somewhat similar in appearance, though much smaller in size, is F. Arnottiana, Miq.; Fl. Br. Ind. v. 513; King Fic. 56, t. 68,—found by Mr. Gamble at Thediár in Tehri-Garhwar. It is usually epiphytic, but is found more generally on rocks. Leaves resemiling those of F. Rumphii, but the base is never narrowed to the petiole, and the stipules are larger. Perianth gamophyllous. Receptacles smaller, generally peduncled; basal bracts brown, membranous.

6. **F. religiosa**, Linn.; Fl. Br. Ind. v. 513; King Fic. 55, t. 67A; Brandis For. Flora 415, Ind. Trees 601; Gamble Man. Ind. Timb. 644. Vern. *Pipal*, *Pipli*, Hind.

A large deciduous tree; bark grey, with brownish specks, smooth, exfoliating in irregular flakes; trunk irregularly shaped.

Leaves alternate, 4.5.7 by 3.5 in., orbicular-ovate, thinly coriaceous but tough, shining above, reddish when young, white-tubercled when mature; acumen 1.3 in. long; margins entire, undulate; main lateral nerves 6.8 pairs, joined by prominent closely-reticulate veins; base shallow-cordate rounded or truncate, sometimes abruptly narrowed into the petiole, 5.7-nerved; petiole 3.4 in. long, terete, slender, nodding, jointed to the blade; stipules minute. MALE FLS. very few, often absent, sessile; sepals 3; stamen 1, filament short. Galland Femile Fls.: sepals 5; style short, lateral. Receptacles 5 in. across, sessile, in axillary pairs, sub-globose or somewhat depressed, dark-purple, when ripe; basal bracts 3, rounded, coriaceous, pubescent.

A well known and common tree throughout India, both in forests and about habitations, much planted by Hindus, especially near temples and wells, often up to as high as 5,000 ft. in the OUTER HIMALAYA. It is held in so much veneration by the Hindus that killing a Pipal tree is looked upon as a great sin, second only to that of killing a Bráhman.

Wood greyish-white, moderately hard, not so mottled as of the preceding species; weight 30-40 lbs. per c. ft. It is made into charcoal and used for packing cases. The leaves and branches are good for elephant-fodder. The milky juice hardens into a substance resembling guttapercha. It is a fast-growing tree and very suitable for avenues, for which purpose it can be propagated by cuttings. It is, however, an epiphyte destructive to forest trees, and often does great damage to buildings and walls on which it grows by sending down roots through their crevices.

New leaves Feb.-Apr. Fr. ripens Apr., May.

- 7. **F. infectoria,** Roxb.; Fl. Br. Ind. v. 515; King Fic. 60, t. 75-79; Brandis For. Flora 414, Ind. Trees 602; Gamble Man. Ind. Timb. 645. Vern. Khabar, Hind.; Dúthli, Pilkhoi, Jaunsar; Pákhar, Dún; Kobrá, Pilkháru, Garhwal. This tree is often mistaken for F. Rumphii and for F. glaberrima; consequently the same vernacular names are usually applied to all three of them indiscriminately.
- A large tree with greenish-grey smooth bark, sometimes sending down a few aërial roots. Leaves alternate, 3-6 in. long, oblong-ovate or ovate, abruptly acuminate, glabrous and shining, rather membranous; margins entire, undulate; lateral nerves 6-8 pairs; base acute, rounded or cordate, 3-nerved; petiole 1.5-2 in. long, channelled. Male fls. few, sessile; sepals 4; stamen 1, anther broad-ovate. Female and Gall fls.: sepals 3 or 4; stigma elongate. Receptacles 25 in. diam., sessile, globose, in axillary pairs, tuberoled, white when ripe; basal bracts 3, ovate, minute.

Not uncommon in the Dún, but abundant in the Pathri Forest and elsewhere in the Saháranpur District, often as an epiphyte on other trees in early life; also found in the Tons Valley near That ist.

Wood grey, moderately hard, but not durable; weight 35 lbs. per c. ft. Medullary rays prominent on a radial section. The young shoots are eaten in curries; the leaves are a good elephant-fodder. The bark gives a 6bre which can be used for rope.

Two varieties of this species occur in our area:-

- 1. The type: leaves rather narrow; petiole hardly exceeding 1.5 in.; receptacles sessile;—more common in the Hills.
- 2. Var. Lambertiana, sp. Miq. Leaves broader, generally cordate or rounded at the base; petiole up to and even exceeding 2 in.; receptacles shortly peduncled, somewhat larger, sometimes white-felted:—found along the foot of the Siwaliks, and also in the plains beyond.

New leaves Feb.-Apr. Fr. ripens May, June, but remains long on the tree.

8. **F. heterophylla**, Linn.; Fl. Br. Ind. v. 518; King Fic. 75, t. 94; Brandis For. Flora 424, Ind. Trees 606; Gamble Man. Ind. Timb. 646.

A straggling shrub. Leaves alternate, 2-6 in. long, very variable, from narrow-lanceolate to broad-ovate, entire or lobed, toothed or repand, scabrid, acuminate; petiole '5-2 in. long; stipules '5 in. long, ovate. Receptacles '5-1 in. long, globose or pyriform, solitary, yellow and smooth when ripe, scabrid when young, mouth partially open; peduncle '5-1 in. long; basal bracts minute.

Generally on banks of rivers and moist localities; e.g., Robbers' Cave, Tapkeswar and such other places in the Dún; rather rare-

F. clavata, Wall.; Fl. Br. Ind. v. 520; King Fic. 87,
 111; Brandis Ind. Trees 604; Gamble Man. Ind. Timb. 645.
 Syn.—F. trachycarpa, Miq.; Brandis For. Flora 421. Vern. Khánoi,
 Jaunsar: Sányoi. Kálsi.

A shrub or small tree with rough branchlets. Leaves alternate, 4-8 in. long, oblong-lanceolate, long-acuminate, distantly toothed; hard and rough; main lateral nerves 6-8 pairs. arcuate; p tiole '1-'2 in. Receptacles axillary, solitary, globose, ellipsoid or obovoid, '5-'8 in. long, with a rough uneven surface, yellow when ripe; pedunole '1-'2 in. long; basal bracts minute.

Shady valleys in the OUTER HIMALAYA and also in JAUNSAR and TEHRI-GARHWAL: Laduaköt, Kálsi, Thadiár, etc. Often cultivated round villages for fodder.

Fr. ripens in May and June,

10. **F. hispida**, Linn.; Fl. Br. Ind. v. 522; King Fic. 116, t. 154; Brandis For. Flora 423, Ind. Trees 606; Gamble Man. Ind. Timb. 647. Vern. Káksá, Ghogshá, Gobhá, Dún; Goblá, Hind.

A moderate-sized tree with hollow branches; bark thin, grey or greenish, warty on old stems, otherwise smooth, often with transverse wrinkles. Leaves opposite, 4-12 in. long, ovate or obovate-oblong, acute or shortly acuminate, serrate or dentate, rarely entire, coriaceous, scabrid above, tomentose beneath; lateral nerves 4-6 pairs, the lowest pair from the base; base rounded or subcordate, rarely cuneate; petiole '5-4 in. long, hispid; stipules '5 in. long, pubescent. Male Fls.: sepals 3, broad. Gall and Female Fls.: perianth tubular and short or none; styles short, lateral. Achene rhomboid. Receptacles obovate, 1 in. long, pale-green and faintly ribbed when ripe, hispid, usually clustered on leafless, often drooping, branchlets from the trunk or old wood, less frequently (generally on very young plants and shoots) in axillary pairs; peduncle '2-5 in. long; basal bracts 3, small, persistent.

Fairy common in the SIWALIK DIVISION, generally in shady places.

Wood dirty-grey, coarse-grained, soft, no heartwood, no annual rings; weight about 30 lbs. per c. ft. The leaves are lopped for cattle-fodder. The young fruit is made into curries. The bark of young shoots gives a strong fibre which is good for rope.

New leaves Feb., Mar. Fr. generally throughout the year.

11. **F.** sæmocarpa, Miq.; Fl. Br. Ind. v. 523; King Fic. 115, t. 152; Brandis Ind. Trees 606; Gamble Man, Ind. Timb. 647. Syn.—F. tuberculata, Wall.; Brandis For. Flora 424.

A low spreading shrub; young shoots, petioles and nerves rusty hirsute. Leaves opposite, crowded at the ends of the branches, 3-9 by '7-1'5 in., narrowly oblanceolate, less frequently lanceolate, acuminate, generally entire, often more or less scabrid; main lateral nerves 6-8 pairs, very arcuate; base 3-nerved, gradually narrowed to the petiole; petiole '3-9 in. long; stipules persistent, scarious, about as long as the petiole. Male Fls. with 3-4 sepals and 1 stanen. Gall and Fem. Fls. without any perianth. Receptacles '5-1 in. across, axillary and solitary on young plants, in short axillary panicles on old stems, pyriform-globose, verrucose, longitudinally 8-10-ribbed; peduncle '3-'6 in. long, pubescent; basal bracts 3, triangular, deciduous.

Robbers' Cave in the Dun; trailing on rocks near streams. Somewhat rare.

Fr. ripens Dec.-Feb.

12. **F. Cunia**, Ham.; Fl. Br. Ind. v. 523; King Fic. 101, t. 126; Brandis For. Flora 421, Ind. Trees. 606; Gamble Man. Ind. Timb. 648. Vern. Khain, Kheiná, Dún; Jarhphali, Hind.

A moderate-sized tree with dark-grey bark. Leaves alternate, 6-10 in. long, oblong-lanceolate, very unequal-sided, acuminate, serate, rarely entire, scabrid on both surfaces or glabrate above and pubescent beneath, coriaceous; lateral nerves 8-12 pairs; base semicordate or semisagittate with a large round 3-nerved lobe on one side; petiole '2-'6 in. long, scabrid; stipules '7-1 in. long, linear-lanceolate. Male sepals 3. Female and gall sepals 4, united below; style lateral. Achene ovoid, mucilaginous. Receptacles globose or pyriform, '5-'7 in. diam., hispid, reddish-brown and ribbed when ripe, on leafless panicled racemes which issue in great numbers from the trunk and the larger branches, and are often several feet long.

Along ravines and watercourses in the SIWALIK DIVISION, and also up to 4,000 feet in JAUNSAR and TEHRI-GARHWAL; fairly common.

Wood greyish-brown, rough, moderately hard; weight about 35 lbs. per c. ft. The fibres of the bark are made into coarse ropes. The fruit is eaten, though somewhat insipid. The leaves are good for fodder, and can be used for polishing wood.

Fr. ripens in Aug., Sept. or throughout the year.

13. **F. scandens**, Roxb.; Fl. Br. Ind. v. 526; King Fic. 129, t. 162; Brandis For. Flora 421, Ind. Trees 609; Gamble Man. Ind. Timb. 648. Vern. *Makhotá*, Jaunsar; *Chhánchri*, Dún and Garhwal.

A climbing shrub, stem often rooting; bark rather thick, horizontally wrinkled, tougher when dry than the porous wood inside. Leaves alternate, 2-4 in. long, ovate or elliptic, acute, entire, coriaceous, scabrid above, pubescent beneath; lateral nerves 3-6 pairs above the basal pair; base rounded; petiole 3-7 in., hairy; stipules '2 in., acute. Receptacles solitary or in pairs, globose, '3 in. diam., rough, often hairy outside, greenish-yellow when ripe; peduncle '3-6 in. long; basal bracts 3-4, ovate, persistent.

Common in the SIWALIK and JAUNSAE DIVISIONS, up to 5,000 ft., generally in damp places or not far from watercourses.

Fr. ripens rainy season.

F. foveolata, Wall.; Fl. Br. Ind. v. 528; King Fio. 133,
 t. 166-168; Brandis For. Flora 423, Ind. Trees 608; Gamble Man. Ind. Timb. 648.

An evergreen scandent shrub with pubescent shoots and rooting branches. Leaves alternate, 2-4 in. long, ovate elliptic oblong or lanceolate, usually acuminate (acumen '5-'7 in. long), entire, membranous or thinly coriaceous, glabrous above, pubescent or glabrescent beneath; lateral nerves 3-6 pairs; base rounded or cuneate, 3-nerved; petiole '5-'8 in., hairy. Receptacles '3-'5 in. diam. if globose, twice as long if ovoid, hairy; peduncle '1-'3 in. long; bracts 3, ovate, membranous, reflexed.

Generally in the same sort of localities as F. heterophylla; rather rare: Robbers' Cave, Dehra Dún, 2,500 ft.

15. **F. palmata**, Forsk.; Fl. Br. Ind. v. 530; King Fic. 146, t. 185; Brandis Ind. Trees 607; Gamble Man. Ind. Timb. 649. Syn.—F. virgata, Roxb.; Brandis For. Flora 419, Vern. Phéru, Khemri, Dún; Anjiri, U. P.; Fagwára, Punjab.

A bush or small tree with smooth grey bark. Leaves alternate, 3-5 in. long, orbicular-ovate, acute or apiculate, toothed or serrate, sometimes deeply palmately lobed with the lobes pinnatifid, scabrid above, tomentose beneath; lateral nerves 6-8 pairs, the lowest pair from the base; base truncate or abruptly narrowed to the petiole; petiole '5-1 in. long, pubescent; stipules ovate, acute. Male fls. on hairy pedicels. Gall fls.: style lateral, very short; stigma dilated. Female fls.: style subterminal, long, stigma 2-fid. Receptacle '5-1 in. diam., usually solitary, subglobose or pyriform, generally pubescent, yellow when ripe; basal bracts 3, acute, deciduous; peduncle '5-7 in. long.

Common in Jaunsar and Tehri-Garhwal, up to 5,000 ft., also along river banks a long way into the plains, no doubt from seeds deposited by flood-water, e.g., the banks of the Jumná, Sông and Súswá: Ambéri, Kánsráu; Khárá, etc.

Wood white, close- and even-grained, moderately hard; weight about 40 lbs. per c. ft. The leaves are lopped for cattle-fodder and the fruit is eaten.

New leaves Mar., Apr. Fr. ripens June-Oct.

Closely allied to this species is the Fig-tree, F. Carica, Linn., Vern. Anjir, which is cultivated for its fruit in Dehra and Sahá-ranpur. Indigenous in Syria, Palestine and Southern Europe.

16. F. nemoralis, Wall.; Fl. Br. Ind. v. 534; King Fic. 161, t. 206; Brandis For. Flora 424, Ind. Trees 608; Gamble Man. Ind. Timb. 649. Vern Dúdhlá, Dúdhoi, Jaunsar; Parphútá, Dúdhlá, Garhwal. The type of this plant has not been found in the region of this Flora. The following description refers to var. Fieldingii, Miq.

A small handsome tree, not epiphytic; bark thin, greyishbrown, fairly smooth. Leaves alternate, 4-6 by 1-2 in., lanceolate or elliptic, sharply long-acuminate, quite entire, membranous, glabrous; main lateral nerves 8-12 pairs, rarely more, with regular reticulations between, which are very distinct and dark-coloured beneath, especially when young; base very acute, 3-nerved; petiole '7-13 in. long, slender; stipules '3-'5 in. long, convolute, glabrous. MALE FIS. pedicelled, few in the fem. receptacles, numerous in gall-receptacles; sepals (in all fls.) \$\frac{3}{2}\$, lanceolate, fleshy; stamens 2-3. Gall FIS. many: ovary ovoid, crustaceous. Fem. FIS. few; ovary triangularly obovoid; style longer than in gall flowers. Re epiacles '2-'3 in. across, axillary, solitary or in pairs, subglebose, glabrous, reddish when ripe; peduncles as long as the receptacles; basal bracts 3, broad, united, persistent.

Jaunsar and Tehri-Garhwal, 3,-7,000 ft., Chakrata, &di, Mautargadh, Mussoorie, etc.; often planted about villages.

The leaves are lopped for cattle-fodder, and the ripe fruit is eaten.

Fr. ripens Oct., Nov.

17. **F. Roxburghii**, Wall.; Fl. Br. Ind. v. 534; King Fic. 168, t. 211; Brandis For. Flora 422, Ind. Trees 609; Gamble Man. Ind. Timb. 649. Vern. *Timlá*, *Timal*, *Tirmal*, Hind.; *Tirboi* Jaunsar.

A middle-sized tree with grey warty bark; ,young shoots hollow. Leaves alternate, 5-15 by 4-12 in., broad-ovate or rounded, acute or mucronate, entire or toothed, subcoriaceous, glabrous or glabrescent above, softly pubescent beneath; lateral nerves 3-6 pairs, joined by transverse veins; base generally deeply cordate, strongly 5-7-nerved; petiole 1-10 in.; stipules 5-1 in., ovate-lanceolate, pubescent. MALE FLS.: sepals large, imbricate; stamens 2-3. GALL FLS.: perianth 2-3-lobed; style short, subterminal. FEMALE FLS.: perianth of gall fl.; style long, lateral. Receptacles turbinate, depressed, largest 2 in. long and 3 in. broad, tubercled, longitudinally ribbed, purple-orange when ripe, in clusters of 6 to 20 on short thick leafless branchlets from the trunk; peduncle 7-1-5 in. long, pubescent; basal bracts 3, triangular. Achene viscid.

SIWALIK and OUTER HIMALAYA; also JAUNSAR and TEHRI-GARHWAL, ascending to 5,000 ft. Very common near Asárori in the Dún and in the Mautargádh in Tehri-Garhwal. Often cultivated for its fruit.

Wood reddish-grey, moderately hard; medullary rays prominent on a radial section weight 34 lbs. per c. ft. The fruit is eaten.

The leaves make a good fodder for cattle and elephants, and are also used for plates.

Fr. ripens Apr.-June.

F. glomerata, Roxb.; Fl. Br. Ind. v. 535; King Fic.
 t. 218; Brandis For. Flora 422, Ind. Trees 609; Gamble Man. Ind. Timb. 650. Vern. Gúlar, Hind.

A middle-sized or large tree; bark smooth, reddish-brown. Leaves alternate, 4-7 in long, owate- or obovate-oblong or oblong-lanceolate, subacute, entire, membranous, glabrous above when full-grown, generally somewhat pubescent beneath; main lateral nerves 3-7 pairs; base obtuse, rarely acute, 3-nerved; petiole 1-2 in., stipules 5-1 in., ovate-lanceolate. Male sepals inflated. Gall and female perianths toothed. Receptacles subglobose, 1-1.5 in. diam., downy, red or orange when ripe, in short thick paniculate clusters on the trunk and larger branches, rarely axillary; peduncle 3-1 in. long; basal bracts 3, triangular-ovate, small.

Abundant throughout the Siwalik Division, especially in ravines, river banks and marshy places. Not uncommon in the Tons Valley, Jaunsar.

Wood grey, soft, mottled on a radial section; weight 25-36 lbs. per c. ft. It is used for making toys and effigies in Bengal, and is said to be durable in water. It is one of the few woods prescribed in Hindu scriptures for sacrificial fires. Bird-lime is made of the milky juice which is also good for gum-boils. The fruit is eaten raw or cooked. The leaves are used for cattle- and elephant-fodder. Several parts of the tree are used in Hindu medicine.

New leaves Jan.-Apr. Fr. ripens Apr.-July.

√ 9. Cudrania, Trecul; G. P. n. 53.

1. C. javanensis, Trecul; Fl. Br. Ind. v. 538; Brandis For. Flora 424, Ind. Trees 614; Gamble Man. Ind. Timb. 651. Vern. Mánda, Dammar, Dún.

A straggling shrub, armed with axillary spines; bark smooth, yellowish-brown, with white oblong lenticels, profusely exuding a pale milk when cut. Leaves alternate, 1-4 in. long, oblong elliptic obovate or oblanceolate, obtuse to acuminate, entire, penninerved; nerves not prominent; petiole '2-3 in. long. Flowers diœcious, in globose heads. Male fils.: sepals usually 4, oblong, imbricate. Stamens 4, erect, included. Female fils.: sepals broader than in the male. Ovary straight; style terminal. simple but with a short rudimentary branch at the base. Flower-heads solitary or in pairs, pubescent; male '2-'3 in. diam.; female smaller at first, '7-1'2 in. diam.

in fruit. Fruit an irregularly shaped compound berry, marked outside in a regular pattern by the thickened tips of the perianthlobes, pinkish-orange when ripe; peduncle 2-3 in. long; seeds nearly as many as the flowers in the female heads, elliptic, compressed: testa black, crustaceous.

Common in the Eastern Dún; also in shady ravines in the SIWALIKS.

Wood tough; heartwood scanty, deep-vellow. The ripe fruit, which has a mawkish sweet taste, is eaten. The leaves are often attacked by a fungus which converts the inner substance into a white brittle mass. This is called mande-ki roti and is eaten by village boys.

Fl. Apr.-June. Fr. Aug.-Nov.

In the same Tribe, and allied to Cudrania, is the somewhat large Genus, Artocarpus, G. P. n. 56, noted for important timber trees, of which, however, none are indigenous in the region of this Flora. Only the following two trees are cultivated in gardens:-

- 1. A. integrifolia, Linn.; Fl. Br. Ind. v. 541. The Jack-tree. Vern. Kanthál. Kathál, Kathár, Hind. A large evergreen tree noted for its dark-green foliage, and huge echinate fruit, which is eaten when ripe or cooked while raw. The wood, which somewhat resembles mahogany, is used for carpentry, and is exported to Europe for various purposes. A yellow dye is extracted from it in Assam and Burma, which is used for dyeing silk.
- 2. A. Lakoocha, Roxb.: Fl. Br. Ind. v. 543. Vern. Dheu, Dun: Barhál, Hind. A large evergreen tree. Leaves large, dark-green. tomentose beneath. Fruit 3-4 in. diam., velvety, yellow when ripe. The wood resembles that of the Jack-tree, though somewhat inferior. The male flower-heads are pickled, and the fruit is eaten both when ripe, and also cooked into a curry while raw. Occasionally wild in damp localities, e.g., Nakraunda and Khairi swamps in the Dun.

V. URTICE Æ.

10. Bæhmeria, Jacq.; G. P. n. 84.

Shrubs or small trees. Leaves opposite or alternate. toothed, 3-nerved; nerves penniveined. Flowers unisexual, in clusters which are axillary or arranged in interrupted axillary spikes racemes or panicles. Male: Perianth 3-5-lobed, valvate; stamens 3-5, inflexed in bud; pistillode globose. Female: Perianth tubular, narrowed to a 2-4-toothed mouth; stigma lateral, filiform, persistent. Achenes crustaceous, at length free and dry.

Analysis of the Species.

Leaves alternate. A tree . . . 1. B. rugulosa. Leaves opposite. Shrubs.

Leaves broad-ovate, petiole long . 2. B. macrophylla.

Leaves broad-ovate, petiole long . 3. B. platyphylla.

1. **B. rugulosa**, Wedd.; Fl. Br. Ind. v. 577; Brandis For. Flora 403, Ind. Trees 617; Gamble Man. Ind. Timb. 657. Vern. Genthi. Genti. Dún and Garhwal.

A middle-sized or small tree. Leaves 3-6 by 1-2 in., alternate, elliptic-lanceloate, closely crenulate or dentate, acuminate, glabrous and dark-green above, pale and velvety beneath, strongly 3-nerved at the base, the nervules anastomosing in an elegant pattern beneath, and forming an intramarginal vein; petiole '7-1'5 in; stipules connate. Clusters of flowers sessile in simple spikes, each in the axil of a cordate bract; spikes axillary, 3-8 in. long. Perianth compressed, ciliate. Achenes stipitate, acute at both ends.

Ravines in the OUTER HIMALAYA, up to 4,000 ft. and occasionally along Sub-Himalayan streams: Rájpur, Kálsi, Málköt, banks of the Sông down to Misirwála, etc.

Wood reddish-brown, moderately hard, even-grained, seasons well, mottled on a radial section. It is easy to cut and work, and is used in the hills for making bowls and various kinds of dairy-utensils.

- Fl. Rainy season. Fr. Cold season.
- 2. **B. macrophylla**, Don; Fl. Br. Ind. v. 577; Brandis For. Flora 403, Ind. Trees 617; Gamble Man. Ind. Timb. 658. Vern. Bará Siáru, Dún.

A large shrub or small tree with dark-brown bark; branchlets 4-sided, strigose. Leaves opposite, 6-12 by 2-3.5 in., lanceolate, very gradually tapering, caudate-acuminate, evenly serrulate, acute or rounded and 3-nerved at the base, hispid, rugulose and pustular

above, pubescent beneath: petiole 6-1 in, long, strigose: stipules lanceolate. Flowers monecious, in long drooping simple axillary spikes often as long as the leaves; clusters 2-3 in. diam., subtended by lanceolate bracts. Fruit obovate-cuneate, compressed, ciliate.

OUTER HIMALAYAN slopes, e.g., above Rájpur, and in ravines round the Nágsidh Hill in the Dún; not very common.

The branches yield a strong fibre which is used for fishing lines, nets, and such other purposes.

- Fl. Aug., Sept. Fr. Nov.-Jan.
- 3. B. platyphylla, Don; Fl. Br. Ind. v. 578; Brandis For. Flora 403, Ind. Trees 617; Gamble Man. Ind. Timb. 658. Vern. Bimol, Rájpur; Siár, Kálsi; Khákshá, Garhwal.

A shrub, often up to 10-12 ft. high, branches rough, darkbrown. Leaves usually opposite, 4-9 by 3-7 in., broad-ovate or orbicular, acuminate or caudate, closely dentate, scaberulous or glabrate, rather membranous; base cordate or rounded; margins and teeth strongly reticulate; petiole 1.5-8 in. long. Flowers whitish. monoccious or diocious. Male spikes often branching, generally not exceeding the leaves. Female spikes (in the typical form) much exceeding the terminal leaves, brown when the achenes are dry. Fruit compressed or angled.

Common in the OUTER HIMALAYA, and in shady ravines and along streams throughout the Dún.

Wood moderately hard, but hardly of any size to be of much use except for fuel. The bark yields a shining-white strong fibre. very good for rope, and probably also for textile purposes. The leaves make a good fodder for cattle.

Fl. Apr.-Aug. Fruiting spikes Oct.-Dec.

I have noticed two distinct varieties of this plant in the Dun: one the typical form described above, with long slender flexuose fruiting spikes; and the other, a small undershrub, with rougher and thicker leaves, and shorter, stouter and erect fruiting spikes ;-Var. scabrella, Wedd.?

11. Pouzolzia, Gaud.: G. P. n. 86.

1. P. viminea, Wedd.; Fl. Br. Ind. v. 581; Brandis For. Flora 405, Ind. Trees 617; Gamble Man. Ind. Timb 658.

A shruh with slender branches; bark thin, rough, grev. Leaves alternate, 1-6 by 2-1.5 in., oblong or ovate-lanceolate dentate or serrate, acuminate, rather rough above, somewhat hirsutely greytomentose beneath; base rounded, strongly 3-nerved; nerves penniveined; petiole 3-1·5 in. long. Flowers usually monœcious, bracteate, in sessile axillary clusters. MALE FLS.: Perianth 4-5-partite, segments valvate; stamens usually 4, inflexed in bud. FEMALE FLS.: Perianth tubular, narrowed and toothed above; stigma lateral, filiform, deciduous. Achenes enclosed in the persistent chaffy perianth.

Occasionally met with in moist shady ravines in the Dún and in Jaunsar. Nakraunda and Gángbhewa swamps; banks of the Tons near Kálsi, etc.

The wood is not of much use except for fuel. The leaves are eaten cooked in Sikkim, and the bark is used to make ropes.

Fl. Rainy season.

12. Villebrunea, Gaud.; G. P. n. 94.

1. **V. frutescens,** Bl.; Fl. Br. Ind. v. 590; Brandis For. Flora 406, Ind. Trees 618; Gamble Man. Ind. Timb. 659. Vern. Gar-tushiárá, Poi-dhaulá, Kumaun.

A shrub with slender pubescent branches; bark dark-grey, rough. Leaves alternate, 3-6 by 15-3:5 in., ovate or elliptic, acuminate, finely serrate or crenate, membranous, concolor or grey beneath, sparsely strigose or glabrate, penninerved in the upper half; base rounded or slightly sub-cordate, 3-nerved; petiole 5-3 in. long, very slender; stipules lanceolate. Flowers usually dicecious, in subsessile clusters or short cymes in the axils of previous year's leaves. Male perianth valvate. Female perianth and bracteoles floshy and juicy in the ripe fruit.

JAUNSAR and DEHRA DÚN, up to 5,000 ft., generally along watercourses; fairly common. Dhármigádh; Nakraunda, etc.

The bark gives a useful fibre.

Fl. and Fr. Apr. and May to Sept. and Oct.

13. Debregeasia, Gaud.; G. P. n. 95.

Shrubs or small trees. Leaves alternate, serrate, 3-nerved; stipules 2-fid. Male fls. clustered; sepals generally 4, valvate; stamens as many as the sepals, inflexed in bud; ovary rudimentary. Female fls. in

small fleshy heads; perianth very minute, tubular, with a contracted mouth: ovary straight, included: stigma generally sessile, tufted. Achenes enclosed in the fleshy perianth: heads succulent when ripe.

Analysis of the Species.

Flower-heads in dichotomous cymes; leaves 1. D. velutina. ashv beneath Flower-heads sessile or subsessile; leaves white beneath 2. D. hypoleuca.

1. D. velutina, Gaud.; Fl. Br. Ind. v. 590; Brandis Ind. Trees 618; Gamble Man. Ind. Timb. 660. Syn.—D. longitolia, Wedd.; Brandis For. Flora 405. Vern. Túshiári, Dún; Sansárú. E. Dún: Siárú, Mussoorie.

A moderate-sized shrub; bark thin, dark-brown. Leaves 3-5 by 4-1 in., oblong or linear-elliptic, acute at the base, acuminate. serrulate, rugose, scabrid and dark-green above, ashy-tomentose beneath; petiole up to 1 in. long. Flowers monœcious (Sir D. Brandis). in small heads which are disposed in short sessile dichotomous cymes. Male perianth longer than the bracteoles. Heads yellow when ripe. with numerous minute nuts imbedded in it.

OUTER HIMALAYAN Valleys and the Dún; also at low elevations in Jaunsar and Tehri-Garhwal: Dúdhli, Sansárú Khálá. above Rájpur; Bámsu, etc.

The stem yields a strong fibre which is made into rope. The ripe fruit is eaten.

Fl. July. Aug. Fr. Nov.-Jan.

2. D. hypoleuca, Wedd.; Fl. Br. Ind. v. 591; Brandis Ind. Trees 618; Gamble Man. Ind. Timb. 660. Syn. D. bicolor, Wedd.: Brandis For. Flora 405, Vern. Túshiári, Garhwal and the Dún; Sansárú, E. Dún; Siár, Sinár, Jaunsar; Siárú, Mussoorie.

A large evergreen shrub with pubescent branches; bark thin, dark-grey. Leaves alternate, 3-6 by '5-1'2 in., oblong- or linearlanceolate, acuminate, serrulate, rather coriaceous, scabrous and with round elevated dots above, thickly white-felted beneath; base acute or rounded. 3-nerved, the midrib much stouter than the two sidenerves; lateral nerves 3-5 pairs above the basal; petiole 1-1 in. Flowers generally directions, in sessile or subsessile axillary heads. Female perianth ovoid, succulent in fruit. Stigma sessile, tufted. Fruit amber-coloured and berry-like, studded with the minute nuts (somewhat resembling strawberry), sweet, but insipid and mucilaginous.

Common along watercourses in the OUTER HIMALAYA and also in JAUNSAB and TEHRI-GARHWAL, generally between 2,000 and 5,000 ft., sometimes ascending to 6,500 ft. (e. g., Lúrli Block, Chakratá; also Mussoorie). Extremely abundant in the Sansárú Khálá, MÁLKÖT FOREST, 3,500 ft., which has been named after it.

The wood is grey, soft and light, not of much use. The fibre is made into twine and rope, and the ripe fruit is eaten.

Fl. Mar., Apr. Fr. June-Aug.

14. Maoutia, Wedd.; G. P. n. 97.

1. M. Puya, Wedd.; Fl. Br. Ind. v. 592; Brandis For. Flora 406, Ind. Trees 619; Gamble Man. Ind. Timb. 660. Vern. Poi, Puá, Hind. Dhaul (white) Khágshi, Dún; Cháwná, Kálsi.

A shrub with hairy shoots; bark dark-grey, with vertical lines of brown lenticels. Leaves alternate, 4-8 by 2-2.7 in., elliptic, candate-acuminate, coarsely dentate or crenate with 15-20 teeth on either side, membranous, scabrid above, softly white-felted beneath; base rounded or sub-acuta, 3-nerved; lateral nerves 3-4 pairs; veins transverse; petiole 5-4 in. long, slende, pubescent. Flowers monœcious or diocious, very minute, in small heads which are disposed in axillary dichotomous cymes or panicles; inflorescence generally with a small rudimentary branchlet bearing minute leaves at the same leaf-axil. Male sepals 5, valvate. Stamens 5, inflexed in bud. male perianth none. Nuts triquetrous.

Fairly common in the Sub-Himalayan ravines: Banks of the Tons Ráu (Dehra Dún), Kálsi, Paléd, etc. Also in the Siwaliks, e.g., the Mohand Pass.

The plant gives a fine white strong fibre, which is used to make fishing-nets, twine and cloth.

Fl. and Fr. May-Nov.

In the same Tribe, URTICEE, are several Genera of annual or perennial herbs with stinging hairs commonly known as nettles; which are fairly well represented in the region of this Flora. The nettles are remarkable for strong fibres. The largest is Girardinia heterophylla, Done.; Fl. Br. Ind. v. 550. Vern, Bichehhü, Hind.;

Kúshki, Jaunsar. Common throughout the Dún and in the Hills, especially about Kulni in Tehri-Garhwal.—G. P. n. 77.

Belonging to quite a small Section of URTICACEÆ, which is destitute of woody plants, is the wild Hemp, Cannabis sativa, Linn., Fl. Br. Ind. v. 487. Vern. Blárq, Hind.,—an annual weed of camping grounds and roadsides in the DÚN, but is also found in all camping places throughout the Hills. Leaves palmatipartite, lobes finely serrate. It gives a strong fibre, quite fit for rope.—G. P. n. 15.

Order 7.—AMENTALES.

FAM. 72. MYRICACEÆ; G. P. N. 157.

Aromatic trees or shrubs. Leaves alternate, simple, exstipulate. Flowers monœcious or diœcious, in bracteate catkin-like spikes. Perianth none. Male fls.: Stamens generally 3-6, on a torus adnate to the bract; filaments free or connate at the base. Female fls.: Ovary sessile, 1-celled, 1-ovuled; style 2-fid. Fruit a resinous drupe with a hard endocarp. Ovule erect, orthotropous, exalbuminous.

1. Myrica, Linn.; G. P. n. 1.

1. **M. Nagi**, Thunb.; Fl. Br. Ind. v. 597. Brandis Ind. Trees 620; Gamble Man. Ind. Timb. 664. Syn.—M. apida, Wall.; Brandis For. Flora 495, Vern. Káiphal, Hind.; Káphal, Jaunsar.

A moderate-sized evergreen tree; bark brownish-grey, rough, vertically wrinkled. Leaves 3.7 by 1 2 in., lanceolate oblanceolate or obovate, obtuse or acute, serrate on young plants, entire on old trees, coriaceous, glabrous above, pale or rust-coloured and with resinous dots beneath; midrib stout; main lateral nerves 12-20 pairs, anastomosing at the ends to form an intramarginal vein; base very acute; petiole 3-6 in. long. Male spikes solitary fascioled or panicled, sometimes with female flowers at the top. Female spikes axillary, slender. Fruit 5 in. long, ellipsoid or ovoid somewhat compressed,

tubercled, reddish or yellowish-brown when ripe; pulp reddish, formed of radiating fleshy hairs; nut rugose.

JAUNSAR and TEHRI-GARHWAL, 3,-6,000 ft.: Korwá, 6,000 ft.; Gádhs in the Tons Valley; etc. Also Málköt Hills, 4,-5,000 ft.

The wood is purplish-grey, hard and close-grained, but apt to split and warp; weight 58 lbs. per c. ft. It is good for fuel. The bark is used as an aromatic stimulant, and externally as a plaster for rheumatism. It is also used to poison fish. The fruit is ea'en and makes a very refreshing sherbet in the hot weather when it ripens.

New leaves Apr., May. Fl. Oct.-Dec. Fr. May, June.

FAM. 73. SALICACEÆ; G. P. N. 160.

Deciduous trees or shrubs, generally fast-grown and soft-wooded. Leaves alternate, simple, stipulate; buds enclosed in scales. Flowers diocious, both male and female in terminal catkins, each in the axil of a bract; bractcoles and perianth none. Stamens 2 or more, generally free, on a variously-shaped glandular disk. Ovary sessile or stipitate, 1-celled; style short or 0; ovules erect, anatropous, generally on 2-4 parietal or basal placentas. Fruit a 2-4-valved loculicidal capsule; seeds few or many, exalbuminous, each with a tuft of long silky hairs.

The plants of this Family can be easily propagated by cuttings, and being also fast-growing, might be useful in quickly filling up blanks.

Analysis of the Genera.

Lvs. short-petiolate; stamons generally 2; fr. 2-valved . . . 1. Saliz.

Lvs. long-petiolate; stamens 4 or more; fr. 2-4-valved 2. POPULUS.

1. Salix, Linn.; G. P. n. 1.

The Willows.

Trees or shrubs. Leaves ovate to narrow-lanceolate, short-petioled; stipules deciduous, larger and more persistent on luxuriant young shoots. Catkins usually on leaf-bearing peduncles. Bracts entire. Disk of 1-2 glands. Stamens generally 2, long-exserted; filaments usually free. Stigma 2-fid or lobed, rarely entire. Capsule conical or narrow-lanceolate, 2-valved, with placentas near the base of the valves.

Analysis of the Species.

1. **S. tetrasperma**, Roxb.; Fl. Br. Ind. v. 626. Brandis For. Flora 462, Ind. Trees 636; Gamble Man. Ind. Timb. 685. Vern. Bed, Jalmálá, Dún; Lailá, Bhainsh, Hind.

A moderate-sized tree; branchlets often tomentose; bark greyis i-brown or blackish, rough with deep vertical furrows. Leaves 3-6 in. long, oblong or ovate-lanceolate, finely serrulate, rarely entire, glabrescent, glaucous b neath; lateral nerves numerous, prominent; petiole 3-1 in. long; stipules ovate or orbicular. Flowers after the leaves, on leaf-bearing peduncles. Male catkins 2-4 in.; female 3-5 in. long. Stamens 5-10, free; anthers minute. Stigmas 2, subsessile, entire. Capsules 1-15 in. long, ovoid, on slender stipes of nearly the sam: length, in groups of 3-4, glabrous or puberulous; seeds 4-5.

Common on river-banks and moist or water-logged places in the Siwalik Division, and also up to 6,000 ft. in Jaunsar and Trhri-Garhwal.

Heartwood red, soft, porous; annual rings not very distinct; weight about 33 lbs. per c. ft. It is used for gunpowder charcoal, and for posts and planks in Assam. The leaves are lopped for cattle-fodder, and the twigs are made into baskets.

New leaves Feb., Mar. Fl. generally Feb.-Apr., less frequently in autumn. Fr. two months after flowering.

2. **S. acmophylla,** Boiss.; Fl. Br. Ind. v. 628; Brandis For. Flora 463, Ind. Trees 636; Gamble Man. Ind. Timb. 686. Vern. B2d, Bádá, Jalmálá, Dún.

A middle-sized handsome tree with flex uose branches which break off easily from the stem; bark reddish-brown. Leaves 2-8 by 3-7 in., those near the catkins much smaller, linear-lanceolate, upper caudate-acuminate, typically quite entire, but glandular-serrulate in a local form, glabrate or with adpressed hairs when young, glabrous and glaucous beneath when mature; lateral nerves faint; petiole 3-5 in. Flowers after the leaves on leafy peduncles. Male catkins 1-2 in; female 1 in. long, both nodding. Bracts long, hairy. Stamens 4-6 (always 6 in the local form alluded to above); anthers short, globose. Stigmas 2, sessile, entire, spreading. Capsule shortly stipitate, ovoid-oblong, glabrous.

Saháranpur-Siwaliks and Dehra Dún; rather rare. Cultivated throughout N.-W. India for oinament, and very extensively in Baluchistan as a fodder-tree: Sháhjal ánpur Ráu, Mohand Pass; Dúdhli, Khairi, etc.

Wood apparently of no great value. The leaves are lopped for fodder.

Fl. Feb., Mar. Fr. May, June.

The local form with reddish fragile branches, glandular-serrulate leaves, and 6-stamened flowers will probably be recognized as a distinct variety, if not a species.

3. **S, alba,** Linn.; Fl. Br. Ind. v. 629; Brandis For. Flora 466, Ind. Trees 637; Gamble Man. Ind. Timb. 687.

A fairly large tree; branchlets green, yellow, red or purple. Leares 2-6 by 5-1 in., narrow-lanceolate, very gradually acuminate, glandular denticulate, silky on both surfaces when young, dull-green above and white with adpressed silky hairs beneath when mature; lateral nerves numerous, fine; petiole '2-'5 in.; stipules '3-'6 in. long, falcately ovate, silky. Flowers after the leaves; peduncle leafy. Male catkins 1-1'5 in. long, compact, cylindrical, drooping; female 2-3 in. long, lax, hairy. Bracts yellow or brown. Stamens 2. Style very short, 2-fid; stigmas 2-fid. Capsule subsessile, ovoid, glabrous or pubescent.

JAUNSAR and TEHRI-GARHWAL, in the Tons, Jumná, and Ganges Valleys, ascending to 6,000 ft.; not very common, often cultivated near villages. Abundant in the Simla Hill States.

The wood is white near the circumference changing to pink or brown towards the centre; pores and madullary rays very fine, numerous and uniformly distributed; annual rings distinct. Weight about 30 lbs. per c. ft. This is the only wood which has so far been found fit for cricket-bats, and the demand for it has increased in the Punjab to such an extent of late years, that it is likely to be profitable to make plantations of it there.

Fl. Apr.

Allied to this is S. babylonica, Linn.; Fl. Br. Ind. v. 629;—the Weeping Willow, which is cultivated as an ornamental plant in gardens and cemeterics throughout India. Its long, slender, pendulous branches are quite characteristic. The leaves resemble those of S. alba in shape and size, but are not so white beneath.

4. **S. elegans**, Wall.; Fl. Br. Ind. v. 630; Brandis For. Flora 466, Ind. Trees 637; Gamble Man. Ind. Timb. 688. Vern. Chhoti Báshroi, Jaunsar; Kadvi, Garhwal.

A middle-sized shrub; branches dark-green, drying black; young parts often grey-pubescent. Leaves 1-3 in. long, elliptic, ebovate or oblong, obtuse or rounded, rarely acute at the tip, serrulate or subentire, hairy along the midrib, otherwise glabrous above, glaucous beneath, subcoriaceous when mature; lateral nerves indistinct; petiole '1-'2 in. long. Flowers after the leaves on leaf-bearing peduncles. Male catkins 1.5 in.; fem. 3-5 in. long. (Quite exceptionally some plants are not only monoecious but bear male and female flowers on the same catkins, the latter occupying the upper half.) Bracts yellow, pubescent. Stamens 2; anthers elliptic. Stigmas 2, subsessile, 2-partite. Capsule conical, under '1 in. in length, but in some forms up to '2 in., shortly stipitate, glabrous. 'The leaves of this and S. daphnoides are often attacked by a brilliant orange-coloured fungus, which is Lecythea salicina, Lev.''—Mr. J. S. Gamble.

An extremely common gregarious shrub in Jaunsar and Tehri-Garhwal, 7,-10,000 ft., generally associated with brambles and roses.

Wood pinkish; annual rings distinct; weight 33 lbs. per c. ft. Chiefly used as fuel. The leaves are used as fodder for cattle and goats.

Fl. Mar., Apr. Fr. May., June.

5. **S. Wallichiana,** Anders.; Fl. Br. Ind. v. 628; Brandis For. Flora 468, Ind. Trees 637; Gamble Man. Ind. Timb. 687. Vern. Bhainshrá, Jaunsar.

A small tree; young parts silky; bark greenish-grey. Leaves 2-5 in. long, oblong or ovate-lanceolate, acuminate, usually quite entire, silvery-tomentose on both surfaces; lateral nerves numerous, not very distinct; petioles '1-'3 in. long. Flowers before the leaves; peduncles very short, generally with 1-3 rudimentary leaves at the base. Male catkins creet, 1-15 in. long; female 3-4 in. long, drooping; rachis tomentose. Bracts black. Stamens 2; anthers elliptic-oblong. Stigmas 2, erect, subsessile. Capsule downy, slender, short-stipitate.

 $J_{\rm AUNSAR}$ and Tehri-Garhwal, ascending to 9,000 $^{\rm ft},$ but common between 7,000 and 8,000 ft.

Wood white or pinkish white; weight 32 lbs. per c. ft. The branches are made into baskets, and the twigs are used as tooth-brush 28.

Fl. Mar., Apr.

6. **S. daphnoides,** Villars; Fl. Br. Ind. v. 631; Brandis For. Flora 469, Ind. Trees 637; Gamble Man. Ind. Timb. 689. Vern. Báshroi, Bhainshrá, Jaunsar.

A small tree; branches dark-green or black, shining or with a glaucous bloom; bark smooth, greenish-grey. Leaves 3-5 in. long, clliptic-lanceolate (narrower in higher elevations), acuminate, serrate, glabrous above, glaucous beneath; lateral nerves numerous. prominent, sitky beneath; petiole 1-4 in., pubescent or downy; stipules lanceolate. Flowers before the leaves; peduncle very short, with or without a few rudimentary leaves. Male catkins 1-2 in., erect; temale 2-4 in., nodding or pendulous, both densely silky. Bracts black tapped, villous. Stamens 2; anthers oblong, yellow. Style fil form; stigmas diverging, entire. Capsule subsessile, glabrous

JAUNSAR and TEHRI-GARHWAL, 2,500 to 15,000 ft. Fairly common about Peoban, Konáin and Kathián.

Heartwood red, shining; annual rings distinct; weight about 34 lbs. per c. ft. In the arid tracts of the Himalaya the wood is used for building, and for pails, tubs and similar purposes. The twigs are made into baskets, and are used for wattle-and-daub walls. The leaves and twigs, and even the bark of branches, are used for oattle-fodder.

Fl. Mar., Apr. Fr. May, June.

S. flabellaris, Anders. and S. Lindleyana, Wall.; Fl. Br. Ind. v. 634, may be mentioned as examples of dwarf willows, similar in habit to Cotoneaster microphylla, Wall. Leaves and catkins up to 1 in. in length. Capsules ovoid, red, glabrous, Such willows are characteristic of the high arctic or alpine climates and are found about the heads of the Ganges, Jumná and Tons Rivers, 11,-15,000 ft., e.g., Harki Dún.

2, Populus, Linn.; G. P. n. 2.

1. **P. ciliata**, Wall.; Fl. Br. Ind. v. 638; Brandis For. Flor. 475, Ind. Trees 640; Gamble Man. Ind. Timb. 690. The Himalayan Poplar. Vern. Piplás (corruption of Poplar), Biáoa, Sharphárá, Tilaunju, Kujási, Jaunsar; Pahári Pipal, Hind.

A lofty tree; bark grey, smooth on young plants, with vertical wrinkles or fissures on cld stems; buds viscid, lanceolate. Leaves 3.7 by 2.5.5 in., broad-ovate, acuminate, finely dentate, marging gland-ciliate, otherwise quite glabrous; base usually cordate, 3.5-nerved; lateral nerves 4.6 pairs above the basal, irregularly forked; petiole 2.5 in. long, compressed above. Flowers before the leaves in lateral catkins. Male catkins 2.4 in. long, somewhat interrupted; female 6.9 in. long, lax in fruit. Disk toothed, embracing half the ovary. Bracts 3 in. long, early caducous. Stamens indefinite; filaments short, very slender. Stigmas 3.4, obcordate, subsessile. Capsule 3.5 in. long, ovoid, 3.4-valved; stipes and hairs of the seeds as long as the capsules.

JAUNSAR and TEHRI-GARHWAL, 4,-10,000 ft.; sometimes cultivated. Affects sunny blanks with a light soil. Male trees are very scarce.

Wood white or brownish-grey, shining, soft; annual rings distinct. Medullary rays fine, very numerous. Weight about 30 lbs. per c. ft. The wood is used for water-troughs, and the leaves are valued as fodder for goats.

Leafless Oct.-Feb. Fl. Mar., Apr.; the males much earlier than the females. Fr. May, June.

Order 8.—QUERNALES.

FAM. 74. JUGLANDACEÆ; G. P. N. 156.

Trees, often strongly aromatic. Leaves alternate, pinnate, exstipulate. Flowers monœcious, bracteate. Male fls. in lateral catkins. Perianth flat, 3-6-lobed, adnate to the supporting bract which is stipitate. Stamens 2-40, on lateral bracts; filaments short; anthercells parallel. Female fls. subsolitary or spicate. Calyx adnate to the ovary; limb superior, 4-toothed. Petals minute or none. Ovary 1-celled, 1-ovuled; style 2-fid. Fruit a 1-seeded 2-valved nut or drupe; cctyledons contorted or corrugated.

Analysis of the Genera.

Fem. fl. subsolitary; bracts not enlarged in fr. 1. JUGLANS.

Fem. fl. spicate; bracts produced into a wing in fr. 2. ENGELHARDTIA.

1. Juglans, Linn.; G. P. n. 2.

1. J. regia, Linn.; Fl. Br. Ind. v. 595; Brandis For. Flora 497, Ind. Trees 619; Gambie Man. Ind. Timb. 662. The Walnut. Vern. Akhrot, Hind.; Akhor, Okhár, Jaunsar.

A large aromatic deciduous tree with velvety shoots; bark grey, longitudinally fissured. Leaves imparipinnate, 6-15 in. long, thickly tomentose while young. Leaflets 5-13, lateral subsessile, opposite or suboprosite, 3-8 by 2-4 in., elliptic-oblong, generally entire, rather coriaceous, glabrescent or pubescent along the nerves beneath; lateral nerves 15-20 pairs. Male catkins green, 2-5 in. long, sometimes in pairs, in the axils of previous year's leaves; bracts stalked, oblong, lobed. Stamens 10-20 or more. Female Ris. 1-3, opposite the terminal leaf. Calyx indistinctly 4-toothed. Petats 4, green, narrow-lanceolate, minute, in the sinuses between the calyx-teeth. Stigmas more or less fleshy. Fruit 2 in, long, ovoid, glabrous

or pubescent, green, with vellow dots; pericarp leathery, very aromatic. Nut 1-1.5 in. long, ribbed, more or less thick-shelled. 2valved; cotyledons irregularly corrugated, 2-lobed at the back, oily.

Wild throughout JAUNSAR and TEHRI-GARHWAL, between 4,000 and 10,000 ft., and generally cultivated about villages in the HILLS.

Heartwood grevish-brown with darker straks, often mottled. even-grained, moderately hard, scasons and polishes well; weight 40-50 lbs. per c. ft. It is in great demand for gun-stocks and is used for ornamental furniture throughout the Himalaya. The bark is used as a dye and in medicine, and is exported to the plains for cleaning the teeth. The nut is a well-known article of commerce, and the rind of the unripe fruit is used to intoxicate fish, and for tanning and dving. The leaves are used for cattle-fodder. The tree attains an enormous size, as much as 100 to 120 feet in height and 28 feet in girth. The cultivated trees, however, have a low spreading crown not more than 50 feet high, and a short trunk about 8 or 10 ft. in girth.

Leafless in cold weather. New leaves and fl. Feb.-Apr. Fr. July-Sept.

2. Engelhardtia, Leschen.; G. P. n. 4.

1. E. Colebrookiana, Lindl.; Fl. Br. Ind. v. 596; Francis For. Flora 499, 1nd. Trees 620; Gamble Man. Ind. Timb. 664. Vern. Mowá, Mauwá, Jaunear (Tons Valley).

A small deciduous tree with grey bark; young shoots tomen-Leaves imparipinnate, 8-12 in. long. Leaflets 6-11, the terminal smallest, often absent (by abortion), the lateral sub-opposite. short-petioluled, 3-5 in. long, obovate or elliptic-oblong, obtuse or acute, entire, subcoriaceous, glabrescent above, densely tomentose beneath; main lateral nerves 8-12 pairs; base unequal-sided, sometimes half acute and half rounded. MALE FLS. in cylindrical lateral . catkins, or exceptionally at the lower half of female spikes. Perianth 3-6-lobed, adnate to a 3-lobed stipitate bract. Stamens 4-12: filaments very short. FEMALE FLS. in drooping bracteate spikes 5-8 in long. Calyx adnate to the ovary, 4-toothed. Stigmas 2, linear. papillose. Fruit a small globose nut, '2-'3 in. diam., villous, adnate to the much enlarged 3-lobed bract; lobes of bract with a straight midrib and reticulate veins; middle lobe 1-1.3 in. long; lateral lobes '7 in. long.

Common and often gregarious in the Malkot and Mussoorie HILLS and in the Tons Valley, JAUNSAR, and also, according to Sir D. Brandis, in the SIWALIK TRACT and N.-W. HIMALAYA, up to 6.500 ft., but has not, so far, been met with in the Saháranpur-Siwaliks or anywhere above 5,000 ft. in the region of this Flora.

The wood is reddish-grey, even-grained, moderately hard, seasons and polishes well, but is not durable; weight 33 lbs. per c. ft. The leaves and branches are burned for use as manure.

Leafless Dec.-Feb. New leaves and fl. Mar., Apr. Fr. May,

June.

FAM. 75. FAGACEÆ (CUPULIFERÆ); G. P. N. 159.

Trees or shrubs. Leaves alternate, simple, stipulate. Flowers generally monœcious. Male fls. in catkin-like spikes; sepals 1-5, or absent; stamens 2-20, on a hairy torus. Female fls. solitary or in dense spikes or heads; perianth adnate to the ovary, or absent; ovary 2-3-rarely more-celled; style-arms as many as cells in the ovary; ovules 1 or 2, pendulous. Fruit included within, or in the axils of, enlarged bracts; seed pendulous, exalbuminous.

This Family includes the following Tribes represented in the area covered by this Flora by the Genera analysed under them:—

I. Betules.*—Male perianth of 4 or fewer segments; fem. perianth absent. Female flowers many in dense spikes. Ovary 2-celled; cells 1-ovuled.

Scales of female spikes thin, deciduous
Scales of female spikes woody, persistent 2. Alnus.

II. CORYLEE.—Male perianth absent; female perianth adnate to the ovary. Female flowers in pairs in the axils of bracts that are much accrescent in fruit. Ovary 2-celled; cells 1-ovuled.

^{*} This Tribe has affinities with those placed under Order Amentales and is for this reason treated as a separate Family by some authors.

III. QUERCINE E.—Male perianth 4-10-lobed; female perianth adnate to the ovary. Female flowers few in an involucre of bracts. Ovary 3-7-celled; cells 2-ovuled.

Bracts many, small, adpressed, usually imbricate 5. Quercus.

I. BETULEÆ.

1. Betula, Tourn.; G. P. n. 1.

Deciduous trees or shrubs; outer bark papery, peeling off in horizontal rolls. Leaves penninerved, toothed or serrate; stipules deciduous. Flowers monœcious, spicate. Male spikes drooping; bracts stalked, peltate, bearing on the inner face 2-3 bracteolate flowers; sepals 2-4. Stamens 2; filaments forked, separating the anther-cells. Female spikes erect or pendulous; bracts imbricate, each with two bracteoles on either side; perianth none. Ovary compressed; styles 2; stigmas terminal. Fruit a 1-seeded winged lenticular nut.

Analysis of the Species.

1. **B. utilis**, Don; Fl. Br. Ind. v. 599; Brandis Ind. Trees 622; Gamble Man. Ind. Timb. 668. Syn.—*B. Bhojpattra*, Wall.; Brandis For. Flora 457. Vern. *Bhújpattra*, Hind.; *Bhúj*, Jaunsar and Garhwal.

A moderate-sized tree; bark brownish-white, with numerous horizontal lenticels; extremities pubescent. Leaves 2-3 by 1·5-2·2 in., ovate, acuminate, irregularly serrate, pubescent when young, gland-dotted and hairy along the nerves beneath; lateral nerves 8-12 pairs; petiole 3-6 in.; stipules oblong, 5 in. long. Bracts of male fis. ciliate, stalk scaly; anther-cells distinct. Bracts of female fis. pubescent, 3-lobed, hardened in fruit. Male spikes 4-5 in. long, 2-3 in. diam. Female spikes erect, 1·2 in. long, 5-6 in. diam. Nut with narrow wings.

Tehei-Garhwal, between 10,000 and 14,000 ft. and occasionally in Jaunsar. Gregarious in higher elevations with *Rhododendron Anthopogon* as an undershrub, e.g., at Cháchpur, Chánsil, Harki-Dún and Gangottari. Sporadic specimens occur at such places as Bhújkoti; Deotá, Lambátách Peak, etc.

The wood is pinkish-white, even-grained, tough and elastic; weight 44 lbs. per c. ft. It seasons well and does not warp, and is used for building in the inner arid Himalaya. The bark, however, is by far the most valuable part of the tree. It is used as paper for writing and packing, for umbrella covers, as a lining inside hookatubes, and for roofing houses. The leaves are lopped for cattle-fodder.

Leafless Oct.-Mar. New lvs. and fl. Apr., May. Fr. Aug.-Oct.

- 2. **B. alnoides**, Ham.; Fl. Br. Ind. v. 599; Brandis Ind. Trees 622; Gamble Man. Ind. Timb. 669. Syn.—B. acuminata, Wall.; Brandis For. Flora 458. Vern. Kath Bhúj, Jaunsar.
- A moderate-sized tree; young shoots pubescent; rolls of bark thicker and lenticels shorter than in the last species. Leaves 3-6 by 2-3-5 in., ovate or ovate-lanceolate, sharply acuminate, very irregularly and doubly serrate, pubescent beneath when young, gland-dotted when old; lateral nerves 10-15 pairs; base from rounded to cordate; petiole 5-7 in. long, hairy; stipules lanceolate, 3 in. long. Bracts, stamens and ovary hairy; male bracts sub-sessile. Male and female spikes fascicled or panicled or the latter sometimes solitary, of nearly the same size, 2-5 in. long, '2-3 in. diam. Nut with wings broader than itself.

Fairly common in Jaunsar and Tehri-Garhwal, 5,-10,000 ft., with a somewhat gregarious tendency (e.g., Tútuágádh, Mundáli).

The wood is white, fairly close-grained, but not very hard in Jaunsar, although esteemed for strength and durability in Nepal. Weight 41 lbs. per c. ft. The leaves are lopped for fodder. The bark, peeling off in somewhat stiff narrow bands, cannot be used in the same way as that of the preceding species.

Leafless in winter. Fl. Nov., Dec. Fr. Apr., May.

2. Alnus, Tourn.; G. P. n. 2.

The Alders.

Deciduous trees. Leaves alternate, penninerved, often with tufts of hairs beneath in the axils of the lateral nerves. Flowers monœcious. MALE FLS. in pendulous

spikes, supported by bracts and bracteoles; bracts 3-fid; sepils 4. Stamens 4; anthers subsessile, cells connate. Female Fls. 2 in the axil of each bract, in short erect spikes; bracts woody, persistent in fruit. Styles 2, stigmatose at the tips. Fruit a woody cone; nuts more or less winged.

Analysis of the Species.

Bark smooth, silvery-grey; fruiting spikes many, in large erect panicles . 1. A. nepalensis.

Bark furrowed, brown; fruiting spikes solitary or 3-5 in short erect race nes . 2. A. nitida.

1. A. nepalensis, Don; Fl. Br. Ind. v. 600; Brandis For. Flora 460, Ind. Trees 623; Gamble Man. Ind. Timb. 670. Vern. Puzála, Jaunsar; Kúnis, Tehri-Garhwal.

A large tree; branchlets glabrous; bark compact, silvery-grey. Leaves 3.7 by 2.3.5 in., elliptic or elliptic-lanceolate, acute, entire or denticulate, glabrous above, slightly glaucous beneath; nerves 10-18 pairs; base usually narrowed; petiole generally '3.5 in., sometimes much longer. Male spikes 4-10 in. long, short-peduncled, slender, in terminal drooping panicles. Fem. spikes '2-3 in., pendulous in flower. Fruit spikes '5-1 by '3 in., ovoid or cylindrical, short-peduncled, in lateral panicles. Nuts with a membranous wing.

JAUNSAR and TEHRI-GARHWAL, 3,900 ft.: Chakrata, Lambátách, Deotá, Tons Valley, etc. Generally in ravines or banks of streams.

Wood reddish-white, close- and even-grained, soft but tough. Medullary rays broad, with numerous fine ones between. Weight about 30 lbs. per c. ft. It is used for bedsteads and for the hooked sticks in rope bridges. The bark is used for dyeing and tanning.

Fl. Oct.-Dec. Fr. ripens in winter but remains long on the tree.

2. A. nitida, Endl.; Fl. Br. Ind. v. 600; Brandis For. Flora 460, 623; Gamble Man. Ind. Timb. 670. Vern. *Utis, Kúnis,* Jaunsar.

A large tree; new shoots and petioles pubescent; bark darkbrown, deeply furrowed. Leaves 4-5 by 2-3.5 in., elliptic or ellipticovate, acuminate, entire or obscurely crenate, glabrous; nerves 8-12 pairs; base generally cuneate; petiole 1-1-5 in. Male spikes 2-4 in. long, in erect terminal racemes; peduncle '3-'6 in. Female spikes 1-2 by '7 in. Fruit spike '7-1-5 by '5 in., ovoid, in erect racemes. Nuts with a thickened margin.

JAUNSAR and TEHRI-GARHWAL, usually at low elevations, generally fringing the banks of rivers and streams, e.g., the Tons and Pibar Rivers; Thádiar, Morágádh, etc.

Wood similar to that of A. nepalensis, but somewhat lighter. The economic uses also are the same as of that species.

Fl. Sept., Oct. Fr. ripens in winter but remains long on the tree.

II. CORYLEÆ.

3. Carpinus, Tourn.; G. P. n. 3.

The Himalayan Hornbeams.

Deciduous trees with slender flexuose branchlets. Leaves alternate, membranous, serrate; lateral nerves many, straight, parallel, very regular; buds elongate. Flowers monœcious. Male fls. in drooping lateral spikes, ebracteolate; perianth none; stamens 3-4 cm a hairy torus, filaments forked, separating the anthercells. Female fls. in slender terminal spikes, in pairs at the base of a foliaceous bract; bracteoles 2; perianth superior; ovary 2-celled, 2-ovuled; style-arms 2, filiform. Nut ribbed, at the base of the much-enlarged leafy bract and bracteoles.

Analysis of the Species.

Leaves ovate-oblong, acute; fruiting bracts triangular; branches soft-tomentose 1. C. viminea.

2. C. faginea.

1. C. viminea, Wall.; Fl. Br. Ind. v. 626; Brandis For. Flora 492, Ind. Trees 623; Gamble Man. Ind. Timb. 684. Vern. Shinroi, Shangri, Jaunsar; Chamkharik, Hind.

A middle-sized tree; branches warted; stem irregularly fluted; bark compact, grey, with darker streaks. Leaves 3-4 in. long, ovate-lanceolate, caudate-acuminate, doubly serrate up to the tip, glabrous; base rounded or sub-cordate; petiole '1-'5 in. long, hairy. Male spikes 1-2 in.; female 2-4 in. long. Fruiting bracts 1 in. long, lanceolate, unequal-sided, toothed on the broader side, often lobed at the base on the other side, 3-5-nerved. Nut '1 in. long, glandular.

JAUNSAR and TEHRI-GARHWAL, 5,-7,000 ft., often in shady ravines and along watercourses.

Wood white, shining, moderately hard, warps in seasoning, believed to be durable; no heartwood; weight 50 lts. per c.ft. It is used chiefly for fuel.

Fem. fl. and new leaves Mar., Apr.; male fl. shortly before the leaves.

2. **C. faginea**, Lindl.; Fl. Br. Ind. v. 626; Brandis For. Flora 492, Ind. Trees 623; Gamble Man. Ind. Timb. 684. Vern. Gish, Garhwal; also the names given to the last species.

A middle-sized tree; branches pubescent; bark dark-brown smooth, slightly wrinkled. Leaves 3-5 in. long, ovate-oblong, often falcate, acute, generally with simple serratures, glabrescent; base rounded or sub-cordate, sometimes oblique; petiole 1-3 in. long, hairy. Male spikes 1-2 in., fem. 2-3 in. long. Fruiting bracts 6-7 in. long, 4-6-nerved, pubescent along the nerves beneath, triangular-oblong, very unequal-sided, coarsely toothed and often also lobed on the broader side. Nut 1 in. long.

Between 6,000 and 7,000 ft. in Tehri-Garhwal: Kulni, Sáhlrá, Upper Tons Valley. Rather rare in Jaunsar.

Wood similar to that of the last species.

Fl. Mar., Apr. Fr. July, Aug.

4. Corylus, Linn.; G. P. n. 6.

1. **C. colurna,** Linn.; Fl. Br. Ind. v. 625; Biandis For. Flora 494, Ind. Trees 624; Gamble Man. Ind. Timb. 684. The Himalayan Hazel. Vern. *Kapási, Shárori*, Jaunsar; *Bhutiá Badám*, Hind.

A moderate-sized deciduous tree; bark dark-grey, thin, sometimes exfoliating upwards. Leaves 3-6 in. long, rather membranous,

ovate or obovate, acuminate, often slightly lobed, unequally and doubly serrate, glabrous when mature; lateral nerves 10-12 pairs, straight, generally pubescent beneath, each terminating in a large tooth; base cordate; petiole '7-15 in. long, glandular-pubescent; stipules '6 in. long, lanceolate, hairy; leaf-buds rounded, in hairy ovate scales. Flowers monœcious. Male Fls. 1 in each bract; perianth 0. Stamens usually 4; filaments forked, separating the anther-cells; spikes fascicled, 1-2 in. long, cylindrical, drooping. FEM. Fls. in pairs in the upper bracts of a small many-bracteate bud-like spike; perianth superior. Ovary 2-celled, 2-ovuled. Nuts 1-seeded, 5-7 in. long, globose, somewhat compressed, hard, deep-brown, 2-3 together in a ribbed coriaceous double-involuere.

Jaunsar and Tehri-Garhwal, 5,500 to 10,000 ft., generally in shady places and northern aspects; not gregatious.

Wood pinkish-white, moderately hard; annual rings distinct; medullary rays fine, numerous; weight 35 lls. per c. ft. It is used locally for various purposes. The fruit is as good as English Hazel-nut, and is an important article of food in the hills, where the tree is cultivated for its sake.

New leaves and fl. Mar., Apr. Fr. July, Aug.

III. QUERCINEÆ.

5. Quercus, Linn.; G. P. n. 7.

The Oaks.

Deciduous or evergreen trees. Leaves alternate, penninerved, generally serrate. Flowers monœcious. Male fls. usually in drooping spikes; perianth campanulate; stamens 6-12 or more; filaments slender, anthercells connate. Female fls. solitary or in clusters or short spikes, each enclosed in an involucre of bracts; perianth-tube adnate to the ovary; limb minutely toothed; ovary 3-5-celled with 2 ovules in each cell; styles 3-5. Nut (usually called an acorn) 1-celled, seated in a cup of hardened bracts; seeds 1 or 2; cotyledons thick, fleshy.

Analysis of the Species.

1. Q, semecarpifolia, Smith; Fl. Br. Ind. v. 601; Brandis For. Flora 479, Ind. Trees 625; Gamble Man. Ind. Timb. 671. Vern. Kharshu, Jaunsar.

A middle-sized or large tree, generally evergreen; young parts clothed with soft hairs; bark dark-grey, cracked into more or less 4-sided scales. Leaves 2-5 by 1-3 in., elliptic or oblong, spinous-toothed on young trees, often entire on old individuals, coriaceous, glabrous and dark-green above, generally rusty-tomentose beneath; lateral nerves 6-12 pairs, bifurcating, impressed above; base cordate or rounded; petiole 0-2 in. Male spikes crowded, 2-4 in. long and congested in seed-years, 4-8 in. long and interrupted in other years; perianth-segments obtuse, ciliate; stamens indefinite, anthers apiculate. Fem. spikes short, at the tip of the current year's shoots; styles long, recurved. Acorn solitary, on previous year's shoots, 1 in. diam., globose, black when ripe; cup '5 in. diam., thin, enclosing about a third of the nut.

JAUNSAR and TEHRI-GARHWAL, 8,500 to 10,000 ft., generally gregarious, often mixed with spruce and silver firs, occupying a higher zone than any other oak found in the N. W. HIMALAYA. It is the most important fuel-tree in the Deoban Range, JAUNSAR DIVISION.

Heartwood reddish-grey, very hard. Annual rings not very distinct. Medullary rays of two kinds; a few broad rays with numerous very fine ones between. Weight 53 lbs. per c. ft. The wood splits in seasoning. It is used only locally for building, door-frames, bedsteads, ploughs, and mule-saddle, and is a good fuel. It might, as also the wood of $M\bar{o}ru$, be useful in the plains, but they are too heavy to be floated. The leaves make a good cattle-fodder, and bears are extremely fond of the acorns. The tree coppices well. It seeds produce acorns every year. Trees that bear acorns do not shed leaves

that year, whereas those which produce male flowers are generally leafless by the middle of May.

New leaves and fl. May, June. The female flowers appear with the male flowers and become fertilized by their pollen, but the acoms begin to grow only in the next spring, often before the male flowers of the season have begun to open. By the first week of June the young acoms are about the size of a pea, while the female flowers (which will produce acoms next year) are then just visible. This peculiarity of fructification is, mutatis mutandis, common to all (?) the Oaks found in the N. W. HIMALAYA. Fr. Aug., Sept.,—15 months after flowering.

2. Q. dilatata, Lindl.; Fl. Br. Ind. v. 602; Brandis For. Flora 482, Ind Trees 627; Gamble Man. Ind. Timb. 673. Vern.

Möru, Jaunsar.

A large shade-enduring tree, almost evergreen; bark dark-grey or black, peeling off in longitudinal scales. Leaves 1:5-3:5 by '5-1'7 in., oblong or oblong-lanceolate, acuminate, entire or spinous-serrate, coriaceous, quite glabrous when mature; lateral nerves 8-12 pairs, slender, forked and reticulate; base rounded or cordate; petiole '2-'3 in. long. Male spikes crowded, drooping, lax. 1:5-3 in. long; bracts lanceolate. Fem. spikes short; styles 3-5, linear-clavate. Acorn solitary, on previous year's shoots, '7-1'2 in. long, '5-'7 in. diam., ovoid or oblong, glabrous, brown when ripe; scales of cup closely adpressed.

JAUNSAR and TEHRI-GARHWAL, 6,500 to 9,000 ft., occupying a zone intermediate between that of Bán and Kharshu, often gregarious, but generally associated with the firs and Deodar.

Heartwood reddish-grey, with darker streaks, very hard, seasons well. The broader medullary rays are more numerous but narrower than those of any other species described here; the others very fine, very numerous, and uniform; annual rings indistinct; weight 61 lbs. per c. ft. The wood is the most useful of all the Oaks in the region of this Flora. It is used for building, for agricultural implements, axe-handles, walking-sticks, jhampán-poles, soles of sledges and similar other purposes. The leaves are lopped for fodder. The tree reproduces itself freely both from seed and from coppice-stools. A kind of gall-insect produces galls on the leaves, which are sweet to the taste, and are eaten by the Jaunsaris, insects and all.

New leaves and fl. Apr., May. Fr. Cold season,—16-18 months after flowering.

3. Q. incana, Roxb.; Fl. Br. Ind. v. 603; Brandis For. Flora 482, Ind. Trees 626: Gamble Man. Ind. Timb. 675. Vern., Bán, Jaunsar; Bánj, Garhwal.

A large evergreen tree; bark dark-grey, rough with cracks and fissures. Leaves 3-6 by 1-2 in., oblong- or ovate-lanceolate, acuminate, mucronate-serrate, tough and coriaceous, young pinkish and woolly all over, mature dark-green and glabrous above, densely white- or grey-rarely brownish-tomentose beneath; lateral nerves 12-20 pairs, straight, parallel; base acute; petiole '5-'7 in. long. Male spikes slender, drooping, 2-4 in. long, often much interrupted; perianth 4-5-lobed; anthers glabrous. Fem. fls. axillary, sessile, solitary or clustered, on current year's shoots; styles linear-clavate, spreading. Acorn generally solitary, usually on current year's shoots; cup at first enclosing the nut, glabrate, rough, woody; nut '8 in. long, conico-ovoid, canescent, brown when ripe.

OUTER HIMALAYA, JAUNSAR and TEHRI-GARHWAL, between 4,000 and 8,000 ft., generally gregarious and associated with Buráns and Ayár. Also in the Mothronwála swamp in the Dún, 1,900 ft.

Heartwood reddish-brown, very hard, warps and splits in seasoning. Annual rings indistinct. Medullary rays of two kinds; a few very broad rays with numerous fine ones between. Weight 64 lbs. per c. ft. The wood is used locally for building, and for ploughs, and is a good fuel. The acorns are greedily eaten by bears, monkeys and squirrels, which is a drawback to its reproduction by seed. It coppies well up to about 9 in. diam.

New leaves and fl. Apr., May. Fr. Aug.-Oct.,—15-17 (or 3-5?) months after flowering, but remains on the tree throughout the cold weather.

4. **Q. glauca**, Thunb.; Fl. Pr. Ind. v. 604; Brandis Ind. Trees 627; Gamble Man. Ind. Timb. 677. Syn. Q. annulata, Sm.; Brandis. For. Flora 487. Vern. Inái, Báni, Jaunsar; Phanát, Garhwal.

A large evergreen tree; bark-grey, smooth up to pole stage, afterwards fissured and rough. Leaves 3-6 in. long, oblong or ovatelanceolate, acuminate, cuspidate-serrate except near the base, coriaceous, glabrous and shining above, grey-pubescent when young, afterwards glaucous beneath; lateral nerves 12-14 pairs, straight, parallel; base acute; petiole '5-1 in. long. Male spikes hairy, very slender, drooping, bracts lanceolate, hairy, much longer than the flowers; perianth-segments 5, lanceolate. Female fls. sessile, 2-3 together on stout axillary peduncles, on the current year's shoots. Cup '5-'7 in. diam., of several thin concentric velvety belts of connate scales, sessile on last year's shoots; nut '6-'7 in. long, sub-globose or ovoid, half-buried in the cup.

Shady valleys in Jaunsar and Tehri-Garhwal, 3,-5,000 ft., not conspicuously gregarious, often associated with Laurels and other

evergreen trees. Abundant in the Lúnágádh and Mautárgádh Valleys and their tributaries. Successfully cultivated in Dehra.

The wood is grey or greyish-brown, tough and very hard, handsomely mottled, takes a good polish, but warps and cracks in seasoning. Medullary rays in broad irregular plates. Weight 60 lbs per c. ft. It is used for much the same purposes as Q. dilatata, notably for soles of sledges in the Tehri-Garhwal Leased Forests.

Fl. Mar.-June. Fr. Aug.-Oct., 15-17 months after flowering.

Q. serrata, Thunb.; Fl. Br. Ind. v. 801;—is a deciduous Oak of the N.-E. Himalaya and Khasia Hills which has been successfully cultivated at Dehra Dún. Leaves oblong-lanceolate, spinoustoothed, generally with tufts of hairs in the nerve-axils. Fruiting bracts imbricate, free, recurved, woody; nut at last half-exserted. Wood brown, compact, very hard, closely resembling that of English oak. It is used in Assam for building and various other purposes.

MONOCOTYLEDONS.

Sub-class i. - Petaloideæ.

Order 1.-AMOMALES.

FAM. 76. SCITAMINEÆ; G. P. N. 170.

HERBS, generally with a perennial rhizome and an unbranched stem, often aromatic. Leaves pinnately parallel-nerved from a stout midrib. Flowers irregular, usually 2-sexual, solitary or in spikes or panicles. Calyx superior, free, tubular or spathaceous. Corolla gamopetalous; limb 3-partite. Stamens usually only 1 fertile, the rest reduced to petaloid staminodes, rarely (in Musa) 5 fertile. Ovary 3-celled; ovules many, generally axile; style slender. Fruit a 3-valved capsule, sometimes indehiscent. Seeds often with an arillus.

This Family has great economic importance, but is not of much forest interest within the range of this Flora. The following are cultivated in these parts and are well-known throughout India:—

- 1. Curcuma longa, Linn.; Fl. Br. Ind. vi 214. The Turmeric plant. Vern. Haldi, Hind.—Remarkable for its bright-yellow tubers which are used as a condiment throughout India. Leaves 1-1.5 ft. by 4-8 in.; petiole as long as the blade. Peduncle about 6 in. long. Flowers yellowish. It is much cultivated near Kálsi and Saiá—G. P. n. 9.
- 2. Zingiber officinale, Rosc.; Fl. Br. Ind. vi. 246. The Ginger plant. Vern. Adrak, Hind.—Well-known for its aromatic rootstock which is used as a condiment and also in medicine. Leaves distichous, 6-12 by 1-1-5 in., dark-green. Much cultivated in the Dún and also above Kálsi.—G. P. n. 15.
- 3. Musa sapientum, Linn.; Fl. Br. Ind. vi. 262. The Banana or Plantain tree. Vern. Kelá, Hind.—This differs from the rest of the Family by having five perfect stamens, and unisexual flowers

arranged in a drooping spike. Leaves 4-8 ft. long, glabrous above, usually with a white bloom beneath. Two or three varieties are cultivated in the Dén and Outer Himalaya and also in the Saháran-pur District. A wild variety is found in ravines of the Nágsidh Hill and in the Khairi swamp in the Dén, Sahansra-dhárá and similar other ravines in the Outer Himalaya, and in the Ámláwa valley in Jaunsar.—G. P. n. 34.

4. Costus speciosus, Smith; Fl. Br. Ind. vi. 249;—is a common weed in Sál forests in the Dún, characterised by large white flowers, pink bracts and bright-red capsules.—G. P. n. 178.

Order 2.-LILIALES.

FAM. 77. LILIACEÆ; G. P. N. 178.

Herbs or small shrubs with creeping root-stocks, bulbs or corms. Flowers usually 2-sexual. Perianth coloured, often herbaceous; segments 6 or more in two series, usually imbricate in bud. Stamens 6, free or connate; anthers often versatile. Ovary 3-celled; ovules 1-2, axillary, style 1, often long. Fruit a 3-celled capsule, or a 1- or more-seeded berry; seeds globose or flattened.

This large Family is well known for flowers of great beauty, some of them exquisitely fragrant. Of useful cultivated plants, the Onion, Allium Cepa, Linn., Vern. Piáz, Hind., and the Garlie, Allium sativum, Linn., Vern. Lahsún, Hind., Fl. Br. Ind. vi. 337,—deserve mention. Of forest Genera only the following two are briefly described.

Analysis of the Genera.

Lvs. normal, 3-5-nerved; fls. 1-sexual, umbelled . 1. SMILAX.

Lvs. represented by cladodes; fls. 2-sexual, solitary
fascicled or racemed 2. Asparagus.

1. Smilax, Linn.; G. P. n. 2.

Generally climbing shrubs. Leaves usually alternate, 3-5-nerved, net-veined; petiole often with tendrils near the base. Flowers diœcious, umbelled. Perianth-segments 6, free. Male fls.: Stamens 6, free, sometimes forked at the tip separating the anther-cells. Fem. fls.: Staminodes 3 or 6. Style 0 or very short; stigmas 3. Fruit a globose berry; seeds 1-3, generally 2; albumen horny.

Analysis of the Species.

Petiole narrowly sheathing, without auricles; umbels 2 or 3

. 1. S. macrophylla.

Sheath of petiole amplexicaul and auricled; umbles 10 or more

. 2. S. prolifera.

1. **S. macrophylla**, Roxb.; Fl. Br Ind. vi. 310; Brandis Ind. Trees 641. Vern. *Ram-dataun*, U. P.

A large prickly climber, stem sometimes exceeding 1 in. in diam. Leaves ovate or orbicular, 6-18 in. long, thinly coriaceous, cuspidate, shining above; nerves 5-7 from the rounded or subcordate base; petiole stout 1-1.5 in. long, the lower half narrowly sheathing. Umbels 2-3, many-flowered; male ped incle slender, '5-1.5 in. long, pedicels not exceeding '3 in., stout in fruit. Sepals '2 in. long, linear. Stamens as long as the sepals. 'Stigmas 3, sessile. Berries round, '3-1.5 in. diam.

Fairly common in the Sal forests of the SIWALIK DIVISION.

The stem has a strong fibre which can be used for brushes. The thinner stems are used as tooth-sticks.

Fl. rainy season. Fr. cold weather.

2. **S. prolifera**, Roxb.; Fl. Br. Ind. vi. 312; Brandis Ind. Trees 641; Gamble Man. Ind. Timb. 724. Vern. Ramdataun, U. P.

A stout climbing shrub with prickly stem, occasionally up to 1 in. diameter. Leaves 4-8 by 2-6 in., oblong, ovate or orbicular, coriaceous; nerves 3-7 from above the rounded or sub-cordate base; petiole '5-1-5 in. long, often auricled at the base round the stem; tendrils 2-4 in. long. Umbels 30-40-flowered; peduncles '7-1-5 in.; pedicels '5 in. Sepals '1-in., oblong-lanceolate. Petals as long, but

narrower. Stamens 6, 1-in. long; staminodes of fem. fis. 3. Ovary oblong; stigmas deciduous. Berries round, red when ripe, 3 in. diam.

Economic uses as of the preceding species.

Common in the SIWALIK DIVISION, especially in Sal forests. Also in the OUTER HIMALAYAS.

Fl. Aug., Sept. Fr. Dec.-Feb.

Several other species of Smilax are found in the region of this Flora, of which the following deserve mention:—

- 1. S. parvifolia, Wall.; Fl. Br. Ir d. vi. 304.—A gregarious undershrub with stiff slender zigzag branches. Leaves very variable, 1-3 in. long, ovate or lanceolate, acuminate, membranous; petiole sheathing, 'l in. long, jointed at the top. Peduncles and pedicels very slender, '2-5 in. long. Flowers minute. Berries '3-'5 in. diam. Common in Jaunsar and Tehri-Garhwal, up to 8,500 ft.
- 2. S. vaginuta, Dene.; Fl. Br. Ind. vi. 305.—A plant very similar in appearance to the above, but the je ioles are '3-'7 in. long and jointed below the extremity, and the female flowers solitary. It is found in much the same localities as the above, only ascending somewhat higher, e.g., Deoban—9,000 ft.
- 3. S. aspera, Linn.; Fl. Br. Ind. vi. 306; Brandis Ind. Trees 641.—A large climbing shrub. Leaves 1.5-6 in. long, ovate, deltoid or lanceolate, with a hastate or cordate base; petiole '5-'7 in. long, often prickly; tendrils 2-3 in. Flowers white, sweet-scented; buds oblanceoloid, longer than the pedicels. Berries '2-'3 in., blush. OUTER HIMALAYA and low valleys in JAUNSAR.

2. Asparagus, Linn.; G. P. n. 7.

Erect or straggling shrubs; rootstock generally terminating in a dense fascicle of spindle-shaped farinaceous roots. Leaves reduced to scales or spines, with tufts of green needle-like or flattened rudimentary branchlets (cladodes) in the axils, which are likely to be mistaken for the true leaves. Flowers axillary, solitary fascicled or racemed. Perianth 6-partite; stamens opposite the perianth-segments; style 1; stigmas 3. Fruit a globose berry.

Analysis of the Species.

Stem unarmed. Fls. not racemed; cladodes flat. 1. A. flicinus. Stem spinous, Flowers racemed.

Scandent shrub. Cladodes subulate . 2. A. racemosus. Suberect shrub. Cladodes terete . 3. A. adscendens.

1. **A. filicinus**, Ham.; Fl. Br. Ind. vi. 314; Brandis Ind. Trees 642. Vern. Sharánoi, Kaun'a, Jaunsar.

An erect unarmed shrub. Cladodes 3.5 in. long, flat, falcate, acuminate. Flowers scarcely 1 in. diam., solitary or in pairs, white; pedicels 0.7 in., jointed above the middle, very slender. Berries 2.3 in. diam.

Common in Jaunsar, up to 9,000 ft., e.g., at Deoban.

The tuberous roots are pickled and are used in medicine. The shoots are eaten as a vegetable.

Fl. May, June.

2. A. racemosus, Willd.; Fl. Br. Ind. vi. 316; Brandis Ind. Trees 642; Gamble Man. Ind. Timb. 724. Vern. Satráwal, Dún; Sharánoi, Jaunsar; Satmuli, Hind.

A much-branched scandent shrub with terete stem and triquetrous branchlets; spines '2-'5 in., straight or slightly recurved. Cladodes 2-6 together, '6-1 in. long, narrowly subultte, falcate and divaricate, channelled beneath. Racemes 1-2 in. long; pedicels '15 in. long, jointed in the middle, slender below the joint. Flowers white. 1-'15 in. diam. Anthers purplish. Berries '15-'25 in. diam.

Throughout the Dún and the Plains, ascending to 5,000 ft. in Jaunsan, e.g., Birálgádh, Dhárágádh, etc.

The tuberous roots of this as well as of the following species have the same use as those of A. filicinus.

Fl. Oct., Nov. Fr. Cold season.

3. A. adscendens, Roxb.; Fl. Br. Ind. vi. 31% Vern. Jhirna, Garhwal; Hazar-mult, Hind.

A suberect shrub with stout terete stem and grooved ascending branchlets; spines '5-'7 in., stout, straight. Cladodes 6-20 together, terete and very slender. Racemes 1-2 in. long, many-flowered; pedicels '1-'2 in., jointed. Flowers white, '1-'15 in. diam. Berries '2-'3 in. diam., 1-seeded.

Common in the Dún, especially in Sál forests, e.g., Phándowála.

Fl. Autumn. Fr. Cold season.

Urginea indica, Kunth; Fl. Br. Ind. vi. 347; Vern. Kándá, Saháranpur;—is a small herbaceous plant with long linear leaves, and an erect racemose scape bearing greenish-white flowers. It has a large bitter bulb, which is used by the weavers about Jawálápur to brush and size their fabrics. Found in the Sauáranpur Siwaliks and also in the Tons Valley, e.g., Sendrá, Morá, ádh, etc.—G. P. n. 126.

Lilium giganteur, Wall.; Fl. Br. Ind. vi. 349; Vern. Giotra, Jaunsar, is the largest of all lilies. Stem 6-12 ft. lor g, tapering. hollow. Leaves 12-18 in. long, broadly ovatr-cordate. Flowers 5-7 in. diam., drooping, fragrant; buds linear-oblong, 34 in. long. Anthers 5 in. long, versatile, yellow. Capsule 3 in.; septa feathered. Farly common in damp ravines in Jaunsar, 6,-9,000 ft.; —Deolan, Mundáli, etc. Jaunsari boys make trumpets of the hollow sten s, which give a deep bass note. Fl. July, Aug.—G. P. n. 138.

Sub-class ii.—Spadicifloræ.

Order 1.—PALMALES.

FAM. 78. PALMÆ; G. P. N. 187.

Shrubs or trees with usually an unbranched cylindrical stem, erect or scandent, filled inside with cellular tissue which is traversed by strands of closed fibrovascular bundles. Leaves alternate, pinnatisect or palmatilobed, with numerous nerves parallel to the segments; petiole broad-based, amplexicall or sheathing. Inflorescence a simple or panicled spike, enclosed in one or more spathes. Flowers 1-2-sexual or polygamous, usually 3-bracteate. Perianth inferior; segments 6, in two series, generally persistent, often accrescent in fruit. Stamens usually 6; anthers versatile, sometimes introrse. Ovary 1-3-celled, or of three distinct 1-celled carpels; stigmas 3, usually sessile. Fruit a drupe or berry. Seeds with copious albumen which is ruminate or uniform, solid or hollow.

This most important tropical Family is represented within the limits of this Flora by only two Genera.

Analysis of the Genera.

Erect shrubs. S'reaths not armed; fruit naked. 1. Phænix. Scandent shrubs. S reaths armed; fruit covered with imbricating adpressed scales. 2. CALAMUS.

1. Phœnix, Linn.; G. P. n. 80.

Low or tall palms. Leaves pinnate; leaflets sessile, linear, entire, rigid, folded, obliquely attached to the rachis, the lowest transformed into strong spines; petiole inarticulate, persistent, with a fibrous amplexical sheath. Flowers dioccious, sessile; male in compact, female in interrupted, compound spikes; peduncle axillary, compressed. Male fls.: Calyx cup-shaped, 3-toothed. Petals 3, valvate. Stamens usually 6. Female fls.: Calyx as of the male, accrescent in fruit. Petals 3, imbricate; staminodes 6. Carpels 3, free; stigmas sessile. Fruit an oblong 1-seeded drupe. Seed ventrally grooved; embryo dorsal; albumen even.

Analysis of the Species.

Stem bulbiform. Fruiting peduncle very short . 1. P. acaulis. Stem at length elongate. Fruiting peduncle long. 2. P. humilis.

1. **P. acaulis,** Buch.; Fl. Br. Ind. vi. 426; Brandis For. Flora 555, Ind. Trees 645; Gamble Man. Ind. Timb. 731. Vern. Khajūr, Khajūri, Hind.

Stem like a bulb, never free above the ground. Leaves 2-5 ft. long; rachis laterally compressed; leaflets 9-18 in. long, '5-'7 in. broad, very strongly nerved, thick, folded at first, opening out when mature; base raised on the side of the rachis and decurrent with it. Spadix 6-10 in. long, compressed; branches stout; peduncle of fruiting spadix flat, 6-8 in. long, but generally concealed in the sheaths of the petioles. Fruit seated on the spikelets at a narrow vortical angle,

'5-'7 in. long, ovoid-oblong, with a pinkish tip when young, blackish when ripe.

Common in the Dén and Saháranpur Forests, generally in grass-lands, e.g., Bám Block, Pathri Forest; Doiwála, Jhabráwála, Johrá Block, Bidhálna Block, etc.

The leaves are plaited into a coarse matting, and make excellent brooms for use on fire-traces. The fruit is eaten.

Fl. Dec., Jan. Fr. Apr., May.

2. **P. humilis**, Royle; Fl. Br. Ind. vi. 426; Brandis Ind. Trees 645; Gamble Man. Ind. Timb. 731. Vern. Khajúr, Hind.

A low palm with a slender stem 6-8 ft. high. Leaves 3-8 ft. long; rachis laterally compressed; leaflets 12-18 in. long, thin, smooth, faintly nerved, always folded, generally scattered, sometimes in opposite pairs; base only slightly raised on the side of the rachis, or not at all raised. Male spadix 1 ft. long; female somewhat shorter (excluding the peduncle); spikes often paniculately subdivided; peduncles flat, of fruiting spadix 2-2.5 ft. long, 5-8 in. broad. Fruit almost horizontal, 5-7 in. long, ovoid, generally mucronate, red when ripe.

Saháranpur Siwaliks, especially towards the crest, but common and of considerable size near Ránipur. It also occurs in the Chir forests of Tehri-Garhwal, e.g., in the Lúnágádh and Khúnigádh Blocks.

Economic uses as of P. acaulis.

Fl. Dec., Jan. Fr. Apr.-June.

P. sylvestris, Roxb.; Fl. Br. Ind. vi. 425; Brandis For. Flora 554; Gamble Man. Ind. Timb. 419—The Wild Date Palm—Vern. Khajúr,—is cultivated in the Dύn, and also in the Saháranpur District. It is often 30-40 ft. high, with a crown 12-15 ft. in diam. Fruiting peduncle 2-2.5 ft. by 1-1.5 in. with a large bunch of spikes. Fruit 1-1.2 in. long, yellow while ripening, reddish-brown when fully ripe. Seeds furrowed to the centre. In Bengal and in most parts of Madras a sugary sap is extracted from the tree by cuts made near the head. The leaves are made into mats, and the fruit is eaten.

2. Calamus, Linn.; G. P. n. 102.

1. **C. tenuis,** Roxb.; Fl. Br. Ind. vi. 447; Brandis Ind. Trees 652; Gamble Man. Ind. Timb. 735. Vern. Bet, Bent. Hind.

A climbing palm, growing in clumps from underground rhizomes; the upper part covered with sheaths of leaves. Leaves pinnate, 1.5-2.5 ft. long. Leaflets many, equidistant, gradually smaller.

towards the top, 4-12 by '3-'5 in., linear-lanceolate, acuminate, 3-nerved, the nerves and margins with bristles or prickles; petiole with straight spines; rachis with one row of short recurved conical prickles; sheath with adpressed flat spines and with a whip-like long thong armed with recurved prickles. Spadices axillary, decompound, of various sizes according to position; spathes tubular, lower 6-10 in. long, armed with recurved prickles, upper scurfy. Flowers small, in pairs, male in scorpioid spikelets, female pedicellate and somewhat accrescent in fruit, both on the same spike. Calyx campanulate, 3-toothed. Petals 6, valvate. Stamens 6. Ovary 3-celled. Fruit 5 in. long, elliptic, clothed with closely-imbricating adpressed reflexed scales with dark-brown margins. Seeds ovoid-oblong, 4 in. long.

Marshy places in the Dún, e.g., Gángbhewá, Mothronwála, Gulargháti, Nakraunda, Jogiwála, Khairi, etc.

The cane is locally used for various purposes, chiefly for chairs and morahs. It is, however, inferior in quality to the canes used for the same purposes in Bengal, Assam and Burma, as it becomes bittle very soon, and is not so strong or durable. The leaves are eaten by buffaloes, and the seeds are strung up in rosaries worn by faqirs.

Fl. July, Aug. Fr. Cold season.

FAM. 79. TYPHACEÆ; G. P. N. 190.

Perennial aquatic herbs. Leaves linear, sessile, thick, spongy. Flowers monœcious, very small, densely crowded in cylindrical or globose spikes, male above the female flowers. Perianth 0, or reduced to green scales or hairs. Stamens 1 or more. Ovary superior, 1-2-celled; styles persistent; stigmas laterally papillose. Fruit minute.

A small unimportant Family, of which only one species is briefly noticed:—

1. Typha elephantina, Roxb.; Fl. Br. Ind. vi. 489. Vern. Paterá, Saháranpur.—Leaves radical, bayonet-shaped, 6-10 ft. long, triquetrous; margins often undulate above the middle. Female spike about 1.5 in. diam., brownish-orange, at the end of a long scape. The leaves are made into mats, and are also used for temporary walls. The pollen is said to be made into cakes and eaten. Found in the Pathri Block in the Saháranpur District, where it is rather an important article of minor forest produce. It is also found in swamps in the Dún.—G. P. n. 1.

Order 2.—ARALES.

FAM. 80. ARACEÆ; G. P. N. 191.

Perennial herbs, sometimes scandent. Leaves alternate, generally net-veined and sheathing at the base. Flowers usually 1-sexual and monœcious, the male above the female, sessile, in fleshy spikes which are more or less enclosed in a green or coloured spathe, and often tailed. Perianth 0, or of minute scales. Anthers 2-4-celled. Ovary sessile, 1-3-celled; stigma discoid or lobed. Fruit a berry, free or confluent.

Of this herbaceous Family only two forest plants appear deserving of mention:—

- 1. Scindapsus officinalis, Schott; Fl. Br. Ind. vi. 541. Vern. Poria-bel. Dún.—A fleshy climbing shrub, stem reaching I inch or more in diam., annulate. Leaves 5-12 by 2.5-6 in., ovate or elliptic-ovate, caudate-acuminate; base rather obliquely rounded or subcordate; petiole 3-6 in. long, elbowed at the tip, sheathing, amplexicall. Spathe yellow within. Berries floshy, ovoid or lanceolate, about 6 in. long. It is found in the Sál forsets of the Siwalik Division, trailing on trees by means of suckers from the nodes. Very common in the Dúdhli Block. The stem is traversed by a strong fibre which is easily separated and can be used for various purposes. The berries are used in country medicine, and the leaves as a vegetable.—G. P. n. 78.
- 2. Acorus Calamus, Linn.; Fl. Br. Ind. vi. 555. Vern. Bach, Hind. The Sweet Flag. A marsh herb much resembling Typha in habit. Leaves ensiform, 2-4 ft. by '5-1 in., with wavy margins. Spathe 6 to 18 in. long; spadix 2-3 in. long, '5-'7 in. in diam., sessile, cylindrical, dense-flowered, flowering upwards. Flowers 2-sexual. Sepals 6, orbicular. Stamens 6; filaments flat. Ovary conical, 2-3-celled; ovules many, pendulous. Fruit a few-seeded berry. The strongly aromatic fibrous rootstock which has a piquant pungent taste, is much valued as a medicine, specially for cough.—G. P. n. 97.

Many plants of this Family are cultivated, chiefly for their starchy corms, of which Colocasia Antiquorum, Schott; Fl. Br. Ind. vi. 523; Vern. Ghuiná, is well known throughout the UNITED PROVINCES, and is extensively cultivated in the PLAINS and up to 6,000 ft. in the HILLS, as an important food-plant.—G. P. n. 30.

Sub-class iii. - Glumifloræ.

Order 1.—GLUMALES.

FAM. 81. CYPERACEÆ; G. P. N. 199.

The Sedges.

Grass-like herbs; stems solid, generally triquetrous. Leaves tristichous; sheaths not split. Flowers minute, solitary, subtended by a single glume, in spikes which are variously arranged. Perianth 0, or reduced to bristles or scales. Stamens 1-3; anthers innate. Ovary 1-celled; style 2-3-cleft, branches stigmatose. Fruit a compressed or 3-gonous nut. Embryo central.

Numerous plants of the Family are found in the region of this Flora, some of which are useful as fodder or for other purposes, but they are beyond the scope of this book. One, however, deserves, mention, being noted for its strong fibre:—

Eriophorum comosum, Wall.; Fl. Br. Ind. vi. 664.—Stem 6-20 in., slender, tough. Leaves serrulate, harsh, overtopping the stems. Umbels 2-8 in. diam. Bracts 8-12 in. Glumes dark-brown, glossy. Nuts 3-gonous, beaked, smooth. Common in the Siwaliks and the Himalayas, and put to much the same uses as the Bhábar grass, Ischæmum angustifolium, Hack.—G. P. n. 12.

FAM. 82. GRAMINEÆ; G. P. N. 200.

The Grasses.

Herbs, shrubs or trees; stem jointed; internodes generally hollow. Leaves alternate, simple, entire, closely parallel-nerved; base sheathing, distinct from the blade; sheath almost always split in front to the base, often with a ligule at the apex, sometimes constricted into a petiole and jointed to the blade. Flowers

usually 2-sexual, in variously arranged spikelets. Spikelets with 1-3 empty glumes at the base. Flowering glumes distichous, each with a 2-nerved scale at its axil which is called the palea. Between the palea and the flowering glume is the true flower consisting of 2 or 3 minute ciliate scales (lodicules), and stamens or a pistil, or both. Stamens usually 3, rarely 6 or more, hypogynous; anthers versatile. Ovary 1-celled; styles 2 or 3, clothed with stigmatose hairs. Fruit a 1-seeded caryopsis; embryo erect or oblique, at the base of the grain, with copious mealy albumen.

This large Family is divided into several Tribes of which the most important from a forest point of view is the following:—

TRIBE I. BAMBUSEÆ.

The Bamboos.

This Tribe is distinguished from other Tribes chiefly by comprising all shrubby and tree-like grasses, commonly known as Bamboos,—by the blade of the leaf being petiolate and articulated to the sheath which is variously auricled,—and by being protected, while young, by a second form of sheath which usually produces no true leaf. The flowers, moreover, have generally 6 or more stamens, while those of other grasses have only 3, and the flowering takes place usually at intervals of many years whereas the others flower and generally die every year.

Analysis of the Genera.

Stamens 3; pericarp adnate to the seed. Small bamboos 1. Arundinaria. Stamens 6. Generally large bamboos.

Pericarp adnate to the seed . . . 2. BAMBUSA.

Pericarp separable from the seed . 3. DENDROCALAMUS

1. Arundinaria, Michx.; G. P. n. 277.

Small bamboos. Culms slender, rarely over 1 in. in diameter, hollow; branches short and fascicled at the nodes. Culm-sheaths papery; blade narrow, subulate. Leaves usually small, often with transverse veinlets. Inflorescence paniculate or racemose. Spikelets 1-many-flowered, usually 2-sexual. Empty glumes 2, unequal, membranous. Flowering glumes longer, many-nerved. Palea 2-keeled. Lodicules 3, ciliate. Stamens usually 3. Ovary globose above; stigmas 2-3, plumose. Grain dorsally furrowed, included in the persistent flowering glume and palea.

Analysis of the Species.

Rootstock cespitose; culms crowded.

Leaves without transverse veinlets.

Leaves with conspicuous transverse veinlets

Rootstock long-creeping; culms distant . . 1. A. falcata,
2. A. spathiflora.
3. A. jaunsarensis.

1. A. falcata, Nees; Gamble Bamb. Brit. Ind. 12, t. 11; Man. Ind. Timb. 744, No. 12; Fl. Br. Ind. vii. 381; Brandis For. Flora 562, Ind. Trees 665; Vern. Go-Ningál, Jaunsar; Ringál, Hind.

A small bamboo. Culm 6-10 ft. high, '3-'6 in. diam., cylindrical, sometimes with a white bloom; nodes much swollen; internodes 6-12 in. long. Culm-sheaths scaberulous without, tapering to a truncate tip, 12 by 3 in.; margins ciliate; blade subulate, recurved; ligule toothed. Leaves 3-4 by '2-'5 in., with pellucid glands in rows between the nerves; sheath glabrous. Flowers in panicles, on separate leafless stems. Spikelets '5-'7 in., distant or 3-4 together.

Common between 4,000 and 7,500 ft. in JAUNSAR and TEHRI-GARHWAL; more or less gregarious; Korwá, Chakrata; Mautárgádh, etc.

2. A. spathifiora, Trin.; Gamble Bamb. Brit. Ind. 17, t. 16, Man. Ind. Timb. 745. No. 16; Fl. Br. Ind. vii. 382; Brandis Ind. Trees 665; Syn.—Thamnocalamus spathiflorus, Munro; Brandis For, Flora 563. Vern. Dec. Ningal, Janusar; Ringal, Hind.

Culm 12-20 ft. high, '5-1 in. diam., smooth, glaucous-green when young; nodes prominent; internodes 6-15 in. long. Culmsheaths loose, glabrous; margins ciliate; blade 2-4 in. long, subulate recet; ligule fimbriate. Leaves 3-5 by '4-6 in., linear-lanceolate; margins scabrous; petiole '1-'2 in.; main nerves joined by numerous transverse veins; sheath 2-3 in. long, truncate; auricles bristly; ligule long-ciliate. Flowers in paniculate racemes. Spikelets 1-2'5 in. long, pedicelled, 2-3 together in a narrow spathe-like yellow sheath—whence the specific name.

Common in JAUNSAR and TEHRI-GARHWAL, 7,500-9,000 ft.; generally above the zone of A. falcata; eminently gregarious in habit. It flowered gregariously in JAUNSAR in 1882.

3. A. jaunsarensis, Gamble Bamb. Brit. Ind. 23, t. 22, Man. Ind. Timb. 745. No. 23; Fl. Br. Ind. vii. 384. Brandis Ind. Trees 665. Vern. Ningál or Ringál, Jaunsar.

This handsome little bamboo is easily recognised from A. spathiflora, upon whose zone it encroaches, by its single culms arising from a long creeping jointed rhizome. Culm 10-15 ft. long, 5 in diam, nodes marked by a narrow ring, internodes 9-11 in long. Culm-sheath yellow, glabrous, narrowed to a truncate 2-auricled bristly tip. Leaves 4-6 in long, lanceolate, acuminate, with numerous transverse veins between the nerves. Flowers and spikelets not seen yet.

I happened to be with Mr. Gamble when he made the discovery of this species in the Tutuágádh Block, Mundáli, in May 1891. It is curious that it has not yet been found in any other locality in JAUNSAR. The flowering cycle is not yet known.

A. Falconeri, Benth. & Hook. f.; Fl. Br. Ind. vii. 383,—is also found in Tehri-Garhwal. It closely resembles A. spathiflora, but the leaves have no transverse veins, and the spathe-like sheaths are much smaller. It flowered in EASTERN TEHRI-GARHWAL in 1885 and again in 1906, thus indicating a flowering cycle of 21 years.

These small bamboos are used for fishing rods, hooka-pipes, and locally for baskets and similar other purposes. They flower at intervals of 20-30 years.

2. Bambusa, Schreb.; G. P. n. 286.

Large bamboos, usually growing in clumps. Culmsheaths broad; blade often triangular. Leaves linear or oblong-lanceolate, acuminate, shortly petioled. In florescence usually a large leafless panicle bearing heads of spikelets. Spikelets 1-many-flowered. Empty glumes 1-4. Flowering glumes ovate, lanceolate, mucronate. Palea 2-keeled. Lodicules 3, membranous, ciliate. Stamens 6. Ovary oblong or obovate; stigmas 2-3. Grain furrowed on one side; pericarp thin, adherent.

Analysis of the Species.

Culms distant, unarmed; nodes not much raised;

Culms crowded, armed; nodes prominently raised; leaves and spikelets short.

. 2. B. arundinacea.

1. **B. nutans**, Wall.; Gamble Bamb. Brit. Ind. 32, t. 30; Man. Ind. Timb. 746; Fl. Br. Ind. vii. 387; Brandis For. Flora 567, Ind. Trees 668. Vern. Báns, Hind., which is the common name for all large bamboos.

Culms rising from a creeping rhizome, not crowded, 20-40 ft. high, 1.5-3 in. diam., straight, gracefully nodding; nodes not much raised, often hairy; internodes 15-18 in. long, thick-walled. not shining. Culms-sheaths 6-9 in. long, top rounded, with adpressed black hairs on the back; blade varying in size according to position in the culm, acute, margins recurved, black-hairy within, with 2 large wavy densely-bristly auricles; ligule narrow, dentate. Leaves 6-12 by 1-1.5 in., scabrid at tip and along the midrib and margins; nerves 7-10; tip twisted; base rounded or narrowed; petiole 1-2 in.; sheath striate, produced into a falcate auricle which is crowned with long bristles. Inflorescence a stiff panicle of spikelike branches which bear interrupted clusters of spikelets. Spikelets '7-1 in. long. glabrous, acute, many empty or with buds inside; axis (rachillum) clavate. Lodicules 3, fimbriate. Anthers apiculate. Stigmas 2-3. twisted. Grain oblong, hairy on the top.

Cultivated in the Dvn, also in low valleys in Jaunsar, about villages and in sacred groves; also in gardens for ornament: Barköt; Káluwála; Ámláwa Valley, etc.

Straight, thick-walled and never crowded, it is a very useful bamboo for use as rafters, and as shafts of dog-carts and ekkus.

Flowers at intervals of about 55 years.

2. B. arundinacea, Willd.; Gamble Bamb. Brit. Ind. 51, t. 48, Man. Ind. Timb. 748; Fl. Br. Ind. vii. 395; Brandis For. Flora 564, Ind. Trees 671.; Vern. Kántá Báns. Hind.

A tall thorny bamboo with crowded culms rising from branching rootstocks. Culms bright-green, shining, varying in size, the largest 80-100 ft. high, 6-7 in. diam.; nodes prominent, lower with almost leafless spinescent more or less zigzag horizontal branches; internodes up to 18 in. long, somewhat depressed near the base of the branches, thick-walled; cavity small. Culm sheaths 12-15 by 9-12 in., together with the blade triangular when flattened out, thickly covered with golden hairs when young; blade 2-4 in, long, triangular. acuminate, glabrous without, matted with dark bristles within; margins wavy, involute, thickly ciliate, auriculate; ligule narrow. Leaves 8 by 1 in., often much smaller, linear or linear-lanceolate, glabrous above, glabrate beneath: margins scabrous: tip sharp, stiff: main nerves 4-6, with pellucid glands at intervals; base rounded, often somewhat oblique, ciliate near the petiole; petiole 'l in., often swollen; sheath with short auricles, thickly ciliate when young. Inflorescence an enormous panicle, often comprising the whole culm. Spikelets about 5 in a cluster, 5-7 in. long, lanceolate, acute, bearing a few male flowers above the 2-sexual ones. Lodicules 3, small, fimbriate. Stamens slender, drooping; anthers obtuse. ending in a short beak formed by the base of the style.

Cultivated in the DEHRA DUN and SAHARANPUR DISTRICTS : Ajabpur, Mothrouwala, etc.

Its great strength and superior size make it eminently fit for all building purposes, but owing to the thorns and the crowded condition of the clumps, it is extremely difficult to pull the bamboos out except in very small pieces.

Appears to flowers gregariously at intervals of 30-40 years.

3. Dendrocalamus, Nees; G. P. n. 289.

Unarmed bamboos, often of very large size. Culm-sheaths usually elongate; blade narrowly triangular. Leaves short-petioled, often with pellucid glands. Spikelets few-flowered, in congested globose clusters, on the long branches of a compound panicle. Flowers usually 2-sexual. Empty glumes 2-3, ovate, acute or mucronate. Flowering glume like the empty glumes. Palea of lower flowers 2-keeled, ciliate,—of the uppermost flowers

rounded on the back and not ciliate. Lodicules usually none. Stamens 6. Ovary hairy above; style long; stigma simple. Grain small, surrounded by a crustaceous pericarp.

Analysis of the Species.

1. **D. strictus**, Nees; Gamble Bamb. Brit. Ind. 78, t. 68, 69, Man. Ind. Timb. 751; Fl. Br. Ind. vii. 404; Brandis For. Flora 569, Ind. Trees 675. The Male Bamboo. Vern. Báns, Hind.

A densely-tufted gregarious bamboo, deciduous in dry climates or in years of drought. Culms variable in size according to climate from 20 to 50 ft. in height, and 1 to 3 in. in diam., dark-green, with a white waxy bloom when young, yellowish when old, characteristically crooked and twisted in congested clumps; nodes somewhat swollen. lower often rooting; internodes 10-15 in. long, solid or with a small cavity. Culm-sheaths variable in size, 3-12 in. long, paraboloidal, glabrous or with vellowish-brown hairs on the back; top rounded. ciliate, slightly auricled; blade triangular, hairy, especially within: ligule narrow. Leaves very variable in size, between 10 by 1.2 in. and 1 by '2 in., generally about 6 in. long, linear-lanceolate, rough and more or less hairy on both surfaces, scabrous on the edges; midrib prominent, lateral nerves 3-6 pairs; base abruptly rounded; tip twisted; petiole 1-2 in.; sheath hairy at first, terminating in a prominent callus; auricle short, ciliate; ligule narrow, serrate. Panicle large: clusters of spikelets 1-1.5 in. diam., 1-2 in. apart. Spikelets ·3.·5 in. long, ·1.·2 in. diam., usually hairy outside, with 2.3 fertile and many sterile flowers; glumes all spinescent. Palea emarginate. Stamens long-exserted; filaments fine; anthers '2-'3 in. long. Grain ovoid, beaked, hairy above.

Indigenous and gregarious in the Siwaliks, especially towards Hardwar; cultivated in the D6n.

In North-West India this is the only bamboo that is found wild in any quantity and is therefore used for a variety of purposes. It is strong and durable and, but for its small size, would easily be the best bamboo in India. It supplies many industries, e.g., basketmaking at Hardwar, and the manufacture of furniture at Bareilly.

A few clumps in a forest, or a few culms in a clump here and there, flower every year; but at the interval of a certain number of

years it flowers gregariously over large areas. One such gregarious seeding took place towards Ránipur in 1884.

Fl. Nov.-Apr. Fr. June.

2. **D. Hamiltonii**, Nees & Arn.; Gamble Bamb. Brit. Ind. 84, t. 74, Man. Ind. Timb. 752; Fl. Br. Ind. vii. 405; Brandis For. Flora 570, Ind. Trees 676. Vern. Kághzi-Bans, Hind.

An ugly-looking bamboo with stems slanting on all sides or curved downwards. Culms up to 80 ft. in height and 4-7 in. diam... with long stout branches above, adpressedly densely white-pubescent when young, dull-green when old; nodes marked with root-scars; internodes 12-20 in. long; walls 5 in. thick. Stem-sheaths glabrous or with patches of adpressed hairs; auricles acute; blade lanceolate. with incurved margins: ligule '2 in., smooth, entire. Leaves variable. up to 15 by 2.5 in., broadly lanceolate, cuspidate, smooth above. rough beneath, minutely serrulate at the edges; main lateral nerves 6-17 pairs, secondary nerves with pellucid glands between; base often unequal-sided, rounded; petiole short; sheath glabrous within, with adpressed white hairs without, slightly keeled below the callus; ligule broad. Panicle very large, branches furrowed on one side; clusters of spikelets '5-1'5 in. diameter, '5-1 in. apart, supported by scarious bracts. Spikelets '4 in. long, ovoid, depressed, purple, glabrous; glumes membranous; flowers 2-4, all fertile. Stamens execrted, pendulous; anthers purple, with a hairy tip. Grain broadly ovoid, beaked.

Cultivated in the Dún, and about villages in the Mussoorie and Jaunsar Hills. It seems to thrive well.

Being thin-walled and rather soft, it is not very good for building purposes, but is much used for basket and mat-work. The young shoots are eaten as a vegetable. The Gáros cook rice in the hollow internodes which they place over fire in a slanting position, and keep turning at short intervals until the outside is all charred; then they split the bamboo open to take out the rice.

It flowers both annually and gregariously like D. strictus.

Besides the cultivated rereal crops which supply the staple food of man throughout the world, there are hundreds of grasses of great forest interest, some yielding fibre and paperstock, others supplying forest industries, others again useful as soil-binders, while a great

many are indispensable for fodder. But they are obviously beyond the scope of this little Flora. Only a few forest grasses are mentioned below:—

- 1. Coix Lachryma-Jobi, Linn.; Fl. Br. Ind. vii. 100. Job's Tear. Vern. Sankru, Hindi. Remarkable from the fact that the female spikelets are enclosed in a bract which, when the grain ripens, becomes like a polished hardened nut, open only by a small aperture at the apex. Stem 3-5 ft. Leaves 6-18 by 1-2 in. with wavy margins and cordate base; sheaths smooth; ligule short, glabrous. Grain about 3 in. long, ovoid, bluish-grey, hard, smooth and shining. Fairly common in grass-lands in the Dún and the Hills. Often cultivated for the sake of the grains which are used for food or for brewery purposes. The leaves and stems are good for cattle fodder and the latter is used in S. China as a material for matting.
- 2. Thysanolæna Agrostis, Nees; Fl. Br. Ind. vii. 61. Vern. Pirlú, Dún and Saháranpur. The Broom-grass. This is a tall grass up to 12 ft. high, with a dense bushy fox-tail-like terminal panicle. Spikelets very minute, sometimes viviparous. The large broad leaves somewhat resemble those of bamboos. It is often used for brooms, and the stems furnish the reed-pens used in vernacular writing. Deep ravines and shady places up to 5,000 ft.—G. P. n. 58.
- 3. Saccharum arundinaceum, Retz.; Fl. Br. Ind. vii. 119; Vern. Múnj, Sarwár, Hind.—A tall grass up to 20 ft. high, with a much-branched grey or greyish-brown silky panicle, and a glabrous stem. In the Sahāranpur District the stem which is used for chiks, morahs, etc., is called bind; the flowering scape, which is used for winnowing trays and for light covers over carts (sirki), is called till; and the sheath next to the scape which is twisted into cordage and from which a neat durable matting is made, is called the múnj proper, after which the grass has been named. Common along raus and the foot of the Hills in the Sahāranpur District.—G. P. n. 75.
- 4. Ischamum angustifolium, Hack.; Fl. Br. Ind. vii. 129; Vern. Bhábar, Saháranpur; Báib, Bábai, Hind.—Perhaps the most important of all forest grasses. Steme 3-5 ft. long, wiry, woolly at the base; leaves about 'l in. broad, convolute, very fibrous. Spikes simple or compound, 1-2 in. long, golden- or rusty-villous. Throughout the United Provinces the grass is made into ropes which are used for various purposes. It is also in great demand for papermaking at Lucknow and Calcutta. Common in the Saháranpur Siwaliks.—G. P. n. 91.

- 5. Andropogon Schænanthus, Linn.; Fl. Br. Ind. vii. 204; Vern. Mirchá-gandh, Saháranpur.—A handsome grass 3-6 ft. high. Spikes inside a reddish-brown spathe. Base of leaf-blade rounded or cordate and amplexicaul. When the stems are cut away, the rootstocks get covered with curly posthumous leaves. It is the famous Rusa-grass from which an aromatic oil is extracted. The roots are used in medicine, and the rootstock is largely purchased by a certain class of pilgrims at Hardwar, probably as a souvenir for friends at home. Common in the plains portion of the Ránipur Range, Siwalik Division.—G. P. n. 94.
- 6. Andropogon Nardus, Linn.; Fl. Br. Ind. vii. 205.—An aromatic grass much resembling A. Schænanthus, but the leaves are not rounded nor amplexicaul at the base, and the spathes much smaller. Also it has a somewhat different habitat, being found in the Din, and also in Jaunsar up to 7,500 ft. (No. 25,006 of Mr. Gamble's collection, Mátkángrá, Jaunsar) as well as in the Saháran-pur Siwaliks.
- 7. Anthistiria gigantea, Cav.; Fl. Br. Ind. vii. 216; Vern. Dhá'á-ghá's. Dún; Kumria, Garhwal. The Spear-grass—A tall grass 8-16 ft. high, with a hard solid compound stem, notorious for its long-awned dark-brown hairy seed which readily get into clothes and are not easily got rid of. Common in the StWALIK DIVISION, especially in coppice areas and blanks.—G. P. n. 97.
- 8. Arundo Donax, Linn.; Fl. Br. Ind. vii. 302. Vern. Nal, Hind.—A tall reed with hollow stems. Leaves tapering from an amplexicaul base. Axis of spikelets (rachillum) elongate, glabrous; flowering glume silky-hairy. Panicle thyrsiform. Found along streams and in shady ravines in the Siwalik Division.—G. P. n. 211.
- 9. Phragmites communis, Trin.; Fl. Br. Ind. vii. 303. Vern. Nal, Hind. This is a hollow reed found above 3,000 ft. in the HILLS, e.g., Thadiar and other places in GARHWAL. It is used for a kind of coarse matting.—G. P. n. 212.
- 10. Phragmites Karka, Trin.; Fl. Br. Ind. v11. 304. Vern, Nal, Hind. This reed is a native of the plains of India and is found at Pathri near Hardwar and such other water-logged localities. The stems are of a larger size but softer-walled than those of P. communis, and make a nester kind of matting.

The Genus *Phragmiles* differs from *Arando* by the leaves not being amplexical at the base, by short silky rachilla, and by glabrous flowering glumes.

GYMNOSPERMS.

FAM. 83. GNETACEÆ G. P. N. 164.

TREES or shrubs with articulated branches. Leaves opposite, large or quite rudimentary, exstipulate. Flowers monœcious or diœcious, in axillary or terminal spikes or cones. MALE FLS. tubular or of 2-4 sepals; anthers 2-8, on a column of the connate filaments. Female Fls. a naked erect ovule with several coats, one of which is produced into a style-like tube; stigma 0. Fruit dry or succulent, enclosed in the persistent bracts; seeds 1 or 2; cotyledons 2.

1. Ephedra, Linn.; G. P. n. 2.

1. **E. vulgaris**, Rich.; Fl. Br. Ind. v. 640; Brandis For. Flora 501, Ind. Trees 688; Gamble Man. Ind. Timb. 693. Vern. *Tút-ganthá*, Jaunsar.

A small shrub; branches opposite or whorled, green, striate; nodes 1-2 in. long; bark on old stems grey. Leaves scale-like; scales connate into a 2-lobed sheath, yellow or brown. Spikes '1-'3 in. long, often in whorled clusters; fruiting spikes red, often succulent. Fruit' 3 in. long, ovoid, red and sweet when ripe; seeds 2.

Dry southern exposures of the Deoban Ridge, JAUNSAR; 8,000 to 9,500 ft., e.g., Gidi Khad, below Karamba Peak, etc.

Wood yellowish-white, very close-grained, with inconspicuous pores. Goats browse on the branches, and the fruit is eaten in some places.

Fl. Apr.-June. Fr. Aug.-Oct.

FAM. 84. CONIFERÆ; G. P. N. 165.

Trees or shrubs with monopodial stems, generally evergreen; wood without pores on a cross section;

annual rings very distinct. Leaves alterate, or in alternate fascicles, rigid, generally acicular, exceptionally scale-like or linear, exstipulate. Flowers monœcious or diœcious; perianth none. Male Fls. in deciduous catkins; anthers 1-or more-celled, adnate to the scales of the catkin, or on a column of connate filaments. Female Fls. of 1, 2, or more naked ovules on a carpellary scale, which is free or adnate to the scales of a spike, the whole becoming a cone in fruit; stigma none. Seeds usually winged; cotyledons generally more than two.

Analysis of the Genera.

```
Ovules erect.
  Female cone with only 1 flower; scales imbri-
      cate, basifixed; lys. linear, not adpressed . 3. Taxus.
 Female cone few-flowered, scales decussately
      opposite, peltate; leaves scale-like or sub-
l.
      ulate, adpressed.
    Scales woody, separating in mature fruit;
        seeds winged . . .
    Scales succulent, connate in mature fruit;
        seeds not winged .
                                            . 2. Juniperus.
Ovules pendulous.
  (Female cone many-flowered, scales imbricate,
    basifixed; leaves, generally known as
    needles, not adpressed.)
      Leaves fascicled.
        Lvs. long (in the Indian species), in
            fascicles of 2-5; scales of cone per-
        Lvs. short, in fascicles of many at least
             in buds; scales of cones deciduous. 5. CADRUS.
      Leaves distant.
        Leaves acicular, multifarious; cones
             pendulous, scales persistent . . 6. PICEA.
        Leaves flat, bifarious; cones erect, scales
             deciduous . .
                                            . 7. ABIES.
```

1. Capressus, Linn.; G. P. n. 6.

1. C. torulosa, Don; Fl. Br. Ind. v. 645; Brandis'For. Flora 533, Ind. Trees 693; Gamble Man. Ind. Timb. 696. The Himalayan Cypress. Vern. Leuri, Leauri, Jaunsar; Devidiar, Deviduar, carpenters of Dún and Saháranpur.

A large* evergreen tree with a pyramidal crown and drooping branchlets; bark greyish-brown, peeling off in long thin strips. Leaves opposite, amplexicaul, scale-like, '05 in. long, triangular, more or less closely adpressed, with a gland on either side of the midrib. Male catkins terminal, cylindrical, with decussately opposite peltate scales, each with 2-6 anther-cells near the edge. Female ft. a globose cone consisting of 6-10 decussately-opposite peltate scales, the middle scales bearing 4-6 erect ovules at the base. Mature cone '5 in. diameter, bluish; scales rugose, separating in drying into hexagons. Seeds compressed, with an orbicular wing, '2 in. diam. including the wing; cotyledons 2-3.

JAUNSAR and TEHRI-GARHWAL, 6,-9,000 ft., generally on limestone formations, often crowning rugged limestone precipices. Abundant on N.-E. aspects between the Lakándi and Moilá Peaks, JAUNSAR.

Heartwood light-brown with darker streaks, moderately hard; medullary rays fine, numerous; weight 39 lbs. per c. ft. It is used at Náini Tál for building, and is an excellent timber for sleepers, experiments carried out at the Forest College having proved it to be even more durable than Deodar. It is burnt as an incense in temples.

Fl. Jan., Feb. Fr. Oct., Nov. but remains long on the tree.

C. sempervirens, Linn., is an ornamental tree cultivated in gardens throughout India, which differs from C. torulosa by having a cylindrical crown and branches with erect tips, and a larger cone with tuberoled scales.

2. Juniperus, Linn.; G. P. n. 7.

The Junipers.

Evergreen trees or shrubs. Leaves either all linear or pungent and whorled, or dimorphous, those on

There is a tree near the Temple at Deota, TEHRI-GARHWAL, 9,000 ft.,
 which measured 22 ft. in girth and 154 ft. in height in May 1896.

lower branches or luxuriant shoots being subulate and pungent, and on upper branches scale-like and closely adpressed. Flowers monœcious or diœcious. Male fls. in small cylindrical or ovoid catkins; scales whorled, imbricate, each with 3-6 anther-cells. Fem. fls. in small fleshy globose cones consisting of 3-6 connate carpellary scales, berry-like when mature. Seeds 1-5, with a thick hard testa, not winged; cotyledons 2-3.

Analysis of the Species.

A shrub. Leaves linear, pungent; seed solitary 1. J. recurva. A small tree. Leaves dimorphous; seeds

2 or more 2. J. macropoda.

1. **J. recurva,** Ham., var. **squamata,** Parlat.; Fl. Br. Ind. v. 647; Brandis For. Flora 533, Ind. Trees 694; Gamble Man. Ind. Timb. 698. The Weeping Blue Juniper. Vern. *Gügg il*, U. P.

A bushy prostrate shrub. Leaves in whorls of 3, 15-2 inlong, linear, pungent, somewhat narrowed at the base, flat and bluishgreen above, convex and light-green beneath, often incurved. Catkins at the ends of short lateral branches; the male ovoid, yellow; the female small; ovules erect. Fruit an oblong berry, 3-5 in. diam., with the tips of the scales protruding at the apex, the rest cohering into one mass, dark-purple, smooth, shining when ripe. Seed solitary, oblong, not winged.

TEHRI GARHWAL, from 12,000 ft. upwards: Chánsil, Gangottari, etc. On the Chur mountain, SIMLA HILL STATES.

Sapwood white; heartwood light-red, very fragrant; weight 40 lbs. per c. ft. It is chiefly used for fuel and burnt as an inconse.

Fl. June, July. Fr. Aug.-Oct. of the second year.

2. J. macropoda, Boiss, ; Fl. Br. Ind. v. 647; Brandis Ind. Trees 694; Gamble Man. Ind. Timb. 698. Syn.—J. excelsa. M. Bieb.; Brandis For. Flora 538. The Himalayan Pencil Cedar. Vern. Dhúp, U. P.

A moderate-sized tree with thin reddish-brown fibrous bark; trunk generally gnarled; branchlets slender. Leves of two kinds,— of the lower branches up to 3 in. long, subulate, pungent,—of the upper, scale-like and closely adpressed (resembling those of Cupressus torulosa), ovate, acute, with a large dorsal gland,—all of a light-green colour. Male catkins terminal, on a scaly peducle. Berry 2-3 in. diam., subglobose, glaucous, black when ripe, very resinous; tips of the scales forming transverse ridges; seeds 2-5.

Tehri-Garhwal along the Jádgangá, a tributary of the Bhágirathi (Rai Bahadur Kesharánand).

Sapwood large, white; heartwood dark-red, even- and close-grained, with a scent similar to that of the pencil-cedur; weight about 32 lbs. per c. ft. It is used for fuel and occasionally burnt for incense.

3. Taxus, Tourn.; G. P. n. 13.

1. **T. baccata,** Linn.; Fl. Br. Ind. v. 648; Brandis For. Flora 539, Ind. Trees 696; Gamble Man. Ind. Timb. 701. The Yew. Vern. *Thúner*, *Thúner*, Jaunsar.

An evergreen tree, generally middle-sized, but sometimes very large, with a large spreading crown; bark reddish-grey, thin, smooth, peeling off in longitudinal shreds. Leaves distichous, 1-1.5 by 'l in., ilnear, often cuspidate-acuminate, dark-green and shining above, brownish-yellow and somewhat mealy beneath, 1-nerved, narrowed into a short peticle. Flowers usually diocious, axillary. Male fl. a pedicelled whorl of 3-8 anther-cells on peltate scales. Female fl. a single erect ovule surrounded by a disk, at the apex of a scaly peduncle. Fruit an ovoid berry, '3-4 in long, the disk developing into a fleshy covering which overtops and nearly conceals the compressed wingless olive-green seed; cotyledons 2.

JAUNSAR and TEHRI-GARHWAL, 6,-10,000 ft., generally in shady ravines; common, but not abundant: Jádi Block, Deoban; Tútuá Block, Mundáli; Lambátách; Rikhshin, etc.

Sapwood white; heartwood orange-red, close-grained, hard, smooth, elastic, works and polishes extremely well, but somewhat slow to season. Annual rings wavy. Medullary rays extremely fine, very numerous. Weight 44 lbs. per c. ft. The wood is eminently fit for cabinet-work, and is used for bows, carrying-poles and furniture. The bark is used by Kunawaris as a substitute for tea, this accounting for the long blazes usually seen on road-side trees. The fruit is eaten.

Fl. Mar.-May. Fr. Sept.-Nov.

4. Pinus, Linn.; G. P. n. 26.

Evergreen trees; branches whorled and generally horizontal. Leaves of two kinds: on seedlings and luxuriant shoots single and short; on older shoots and trees in bundles of 2-5 and usually long, the latter at first from the axils of the former. Male catkins crowded at the base of the current year's shoots. Anther-cells in pairs, on a short column, connected at the back by a scale-like connective which is produced at the tip. several such pairs being imbricately close-packed in each catkin. Female cones globose or ovoid, generally at the end of the current year's shoots; scales spirally imbricate, open at first, but closing after fertilization; ovules 2 at the axil of each scale, inverted. Ripe cones ovoid oblong or cylindrical, usually at the base of the current year's shoots; scales thickened and woody, beaked or with a square knob at the apex. Seeds with a hard woody shell, in pairs at the base of each scale, oily, generally winged; cotyledons usually more than two.

Analysis of the Species.

Leaves in clusters of 5, bluish-green; cone cylindrical, with scales not much thickened at the apex . . . I. P. excelsa.

Leaves in clusters of 3, light-green; cone ovoid, with scales much thickened at the apex 2. P. longifolia.

- 1. P. excelsa, Wall.; Fl. Br. Ind. v. 661; Brandis For. Flora 510, Ind. Trees 689; Gamble Man. Ind. Timb. 704. The Blue Pine. Vern. Káil, Hind.; Chil, Jaunsar.
- A large tree; bark smooth slate-coloured and leathery on young stems, grey or greyish-brown corky and with shallow fissures on mature trees. Leaves in bundles of 5, 6-8 in. long, slender, triquetrous, glaucous on the inner faces (giving the foliage its characteristic bluish colour); sheaths entire, deciduous. Male

catkins '3-'4 in. long, ovoid or oblong. Cones generally 2-3 together, 6-12 in. long when ripe, on peduncles 1-3 in. long, cylindrical, erect before fertilization, afterwards pendulous; scales 2-2-5 in. long, 1-1-5 in. broad near the end, spathulate, not much thickened at the end, rhomboid at the back. Seeds blackish, ovoid, acute at both ends, compressed, '25-'35 in. long; wing about three times as long, obliquely truncate; cotyledons usually 9.

JAUNSAR and TEHRI-GARHWAL, 6,-10,000, ft., generally as a companion of Deodar, for which species, if properly guarded against, it is an excellent nurse in early life. In JAUNSAR it is seldom gregatious above 8,500 ft. Occasionally as low down as 4,000 ft., e.g., in

the Giri valley. SIMLA HILLS.

Heartwood pinkish-brown, moderately hard; annual rings distinct, marked by a line of compact wood at the outer edge : medullary rays very fine and very numerous; resin ducts smaller than those of P. longitolia; weight 30 lbs. per c. ft. The wood is more durable than that of chir, and is altogether a much better timber, but is seldom used beyond the hills, the plains people being doubtful of its qualities, probably from its lighter weight. sapwood gives a resin, which, though smaller in yield per individual tree, is much superior in quality to that of P. longifolia. The wood of the stumps is used for torches, and tar and pitch can be extracted from it by destructive distillation. The leaves may be used to stuff cushions. In certain years a sweet liquid, commonly known as honey-dew, is secreted by some Aphids which infest the leaves of the pines and occasionally of other Coniferous trees. This sweet substance is collected and eaten by the inhabitants of the Himalaya. The bark of poles is used like slate for roofing temporary huts. The seeds are sometimes eaten, although too resinous to be much relished.

FL Apr.-June. Fr. ripens Sept.-Nov. of the second year.

2. **P. longifolia,** Roxb.; Fl. Br. Ind. v. 652; Brandis For. Flora 506; Ind. Trees 690; Gamble Man, Ind. Timb. 706. The Long-leaved Pine. Vern. Chir, Hind.; Sarol, Sirli, Kulháin, Garhwal and Jaunsar.

A large light-loving tree with a clear straight bole; bark 1-2 in. thick, outer corky and in thin crisp plates, reddish-brown,—inner brick-red, vertically and spirally furrowed; branches rough, soon corky. Leaves in bundles of 3, 9-12 in. long, obscurely triquetrous, light-green; sheath greyish-brown, persistent, fimbriate, Male catkins '3-'6 in. long, ovoid-cylindric. Cones solitary or 3-'5 together, 4-8 by 3-5 in. near the base, ovoid, on short stout stalks; scales 1-2 by '7 in., beak 4-6-gonous, reflexed, much thickened, generally with a sharp black tip. Seeds '3-'45 in. long, obliquely

oblanceolate, compressed, with a membranous wing, which is rather longer than the seed; cotyledons about 12.

Throughout the Siwalik and Jaunsar Divisions, betweeh 2,000 and 6,500 ft.; generally gregarious, often forming extensive pure forests. Saháranpur Siwaliks, 2,-3,000 ft.; Láduáköt in the Málköt Hills, 4,-6,000 ft.; Tons and other valleys in Jaunsar and Tehri-Garhwall, 3,-6,500 ft.

The heartwood is soft, reddish; annual rings well-marked by a compact belt of darker colour at the outer edge, inner zone spongy; medullary rays fine, numerous; resin-ducts prominent on a vertical section; weight about 41 lbs. per c. ft. The wood is not durable, specially when exposed to wet. It is, however, used in the hills, and is rising in the estimation of the plains people of the Punjab, where it is largely exported for building and other purposes. The sapwood yields large quantities of resin, from which turpentine and rosin are manufactured. The charcoal of the bark is much prized by Jaunsari blacksmiths. The seeds are eaten by the hill-people. Other economic uses are similar to those of Káil, excepting that the bark is never used for roofing.

Fl. Feb.-Apr. Seeds shed Apr.-May next year. The dry cones remain long on the tree.

The important article of food known throughout Northern India as Chilghōzá is the seed of a pine tree, P. Gerardiana, Wall.; Fl. Br. Ind. v. 652,—which is a native of Afghanistan, Kafiristan and Arid Himalaya. Seeds about 8 in. long, oblanceoloid, terete.

5. Cedrus, Loud.; G. P. n. 27.

1. C. Libani, Barrel., var. Deodara, Hook. f.; Fl. Br. Ind. v. 653; Gamble Man. Ind. Timb. 710. Syn.—Cedrus Deodara, Loud.; Brandis For. Flora 516, Ind. Trees 691. The Himalayan Cedar. Vern. (Devadáru, Sans., whence) Deodár, Dedwár, Dewár Hind.; Kelon, Jaunsar.

A very large and tall gregarious tree, probably the largest and longest-lived in India,* noted for its great beauty; branches and branchlets horizontal, tips slender and nodding; crown from pyramidal in early life to spherical when mature; bark greyish- or reddish-brown, with vertical and diagonal fissures. Leaves 1-1.5 in. long, acieular, triquetrous, glaucous-green, mostly in dense fascicles, with a few solitary ones scattered between the fascicles. Male catkins

^{*} There is a section in the Forest College Museum, 27 ft. in girth, the age of which is estimated to be over 800 years.

solitary, at the ends of the branchlets, usually '3-'4 in. long, ovoid. Anthers as in Pinus. Ovules inverted, 2 at the base of each scale. Cones always erect, 4-5 in. long by 3-4 in. near the base, ovoid or pyramidal; scales fan-shaped, imbricate, transversely closely-packed in the cone so as to expose only the outer edges; margins thin. Seeds '35-'5 in. long, triangular or broadly crescent-shaped; wing triangular, '6-'7 in. long; cotyledons about 10.

Deodar is found in a distinct zone of its own, which in Jaunsar and Tehri-Garhwal is between 7,000 and 8,500 ft. In the lower limit the Blue Pine, and elsewhere the Spruce Fir and the Möru Oak are its constant companions.

Heartwood light yellowish-brown, fine- and even-grained, moderately hard, strongly scented. Annual rings very distinct, being marked at the outer edge by a fine line of darker colour. Medullary rays generally very fine but of unequal width; no visible resin ducts. Weight 35-40 lbs. per c. ft. Deodar is one of the three most important timber trees of India, the other two being Teak and Sál. The wood is extremely durable, and is proof against white-ants, and to some extent against wet, on account of the oil which it contains. It is extensively used for building, is very much in demand for sleepers, and is the best wood for shingles in North-Western India. The oil is extracted from it by destructive distillation, and is used as a remedy ter ulcers and eruptions, and also for rubbing on sarnáis (inflated skins used for crossing rivers) to keep them from rotting. The wood is a bad fuel.

Male fl. Sept., Oct. The cones do not begin to grow until April; they ripen and shed seeds in Oct., Nov., i.e., about 13 months after flowering.

6. Picea, Link.; G. P. n. 28.

1. **P. Morinda**, Link.; Fl. Br. Ind. v. 653; Brandis Ind. Trees 692; Gamble Man. Ind. Timb. 716. Syn.—Abies Smithiana, Forbes; Brandis For. Flora 525. The Himalayan Spruce. Vern. Roi, Rái, Jaunsar.

A lofty tree,* with rough greyish-white bark, exfoliating in thin orbicular scales about 1 in. in diam.; branches horizontal; branchlets slender, pendulous. Leaves 1-1.5 in. long, 4-sided, acicular, stiff, scattered in multifarious spirals round the branchlets (which

^{*} Trees up to 24 ft. in girth and 210 ft. in height have been measured near Mundáll, J_{AUN8AR} , 8,800 ft.

look somewhat like bottle brushes). The bud-scales cohere to form a conical cap which falls off when the leaves open. Male cathins single, about '4 in long, oveid, in the axis of the leaves; anther-cells adnate to the stipitate scales. Ovules inverted, in pairs behind the carpellary scale, and in the axis of the imbricating scales of the spike which afterwards becomes the cone. Cones terminal, 4-6 in long, 1'5-2 in. diam., cylindric, pendulous after fertilization, dark-brown when ripe; scales with a thin edge, smooth outside, concave, broadly obovate; base cuneate. Seeds about '15 in. long, obliquely oblong, dark-grey, with a broad spathulate obliquely-truncate wing which is about '5 in. long; cotyledons 8-10.

JAUNSAB and TEHRI-GARHWAL, 7,-11,000 ft., associated in Deodar forests with that species and the Möru Oak, and in higher elevations with Silver Fir and the Kharshu Oak,—generally affecting sunny aspects.

Wood white with a brownish tinge, rather soft; medullary rays very fine and very numerous; resin-ducts scanty; weight 30 lbs. per c. ft. It is used for planks and packing-cases, and for shingles in the hills. It is an indifferent fuel, but the charcoal is fairly good. The bark is used for roofing huts, and to make water-troughs.

Fl. April. Cones ripen in Oct.-Nov.

7. Abies, Juss. G. P. n. 31.

1. **A. Webbiana**, Lindl.; Fl. Br. Ind. v. 654; Brandis For. Flora 528, Ind. Trees 692; Gamble Man. Ind. Timb. 718. The Himalayan Silver Fir.

A lofty tree with a dense cylindrical crown, pre-eminently shade-enduring; branches pendulous, branchlets stout, stiff, spreading horizontally; bark smooth on young stems, dark-brown or grey and split into long and narrow scales on old trees. Leaves 1-2 by 1 in., flat, narrow-linear, narrowed into a short petiole, spirally arranged but declinate on two sides to appear distichous, glossy dark-green above with two faint white lines on either side of the midrib beneath, persistent for at least three years; tip emarginate, generally with two sharp cusps. Cones always erect, oblong or cylindrical, 2-4 in. long, 1.5-3 in. diam., dark-purple when ripe; scales closely imbricate, obovate; edge rounded, thin. Seeds 15-2 in. long, obovoid; wing twice as long, broadly obovate, truncate; cotyledons 5-6.

Tehri-Garhwal, 8,-13,000 ft., generally in moist shady northern aspects and ravines,

Wood white, soft; medullary rays extremely fine and too weak to bind together the annual rings which often separate to form cupshakes. Weight 29 lbs. per c. ft. It is not very durable when exposed to wet but seems to last well as shingles, and is used locally for construction in many parts of the Himalaya.

Fl. Apr. Cones ripen in Sept.-Oct.

Var. Pindrow, Brandis; Fl. Br. Ind. v. 655. Vern *Morindá*, Jaunsar,—differs from the type by having longer leaves (2-3 in.), and more slender cylindrical cones (about 1.5 in. in diam.).

This lofty and graceful tree is common in JAUNSAR and TEHRI-GARHWAL, 8,-10,000 ft., generally on northerly aspects and in shady localities, and often attains an enormous size, trees up to 250 ft. in height and 25 ft. in girth having been found at Mundáli. It is important in the Deoban Range as a fuel tree.

INDEX TO BOTANICAL NAMES.

*** Generic names printed in heavy types are those which have been incorporated in the Analyses, but page numbers have been omitted in the case of those Genera whose characters have not been separately described. Genera in ordinary small types are those which are not included in the Analyses and whose species are only briefly noticed. Names in small Italics are synonyms not accorded precedence in this Flora. Divisions and Families are in Roman capitals, while Orders are in Italic capitals.

Abelia	villosum, Wall 118
triflora, R. Br. 234	Acorus
Ables	Calamus, Linn. xiii, 414
Smithiana, Forbes, 433	Acronychia.
Webbiana, Lindl 434	laurifolia, Bl 73
var. Pindrow.	Actana
Brand 435	spicata, Linn 31
Abrus	Actinidia
precatorius, Linn 151	callosa, Lindl 53
pulchellus, Wall 152	Adhatoda
Abutilon	Vasica, Nees . 309
indicum, G. Don . 59	Adina
ramosum, Guill. &	cordifolia, Hook. f. 238
Perr 59	Æchmanthera
Acacia 174	tomentosa, Necs . 304
arabica, Willd 175	var. Wallichii, . 304
cæsia, W. & A 178	Necs 304
Catechu, Willd 177	Ægle
concinna, DC 177	Marmelos, Correa . 78
eburnes, Willd 176	Æschynomene
Farnesiana, Willd., 175	aspera, Linn 163
Intsia, Willd 178	Æsculus
Var. cæsia, W. & A.178	indica, Colebr 113
pennata, Willia . 179	Alangium
ACANTHACEÆ 5, 19, 303	Lamarckii, Thw. 227
Acer 115	Albizzia 179
cæsium, Wall 117	Julibrissin, Boivin 182
caudatum, Wall 118	Lebbek, Benth 180
lævigatum, Wall 117	lucida, Benth 183
oblongum, Wall 116	mollis, Boivin . 182
pictum, Thunb 119	odoratissima, Benth.181
-	•

procera, Benth 181
stipulata, Boivin 183
Var. Smithiana.
Roxb 183
Thomsonii, Brandis 181
Alnus 396
nepalensis, Don . 397
nitida, Endl 397
Alstonia.
scholaris, Br 277
Alysicarpus
vaginalis, DC 163
AMARANTACEÆ 6, 20.
323
AMENTALES 22, 385
AMOMALES 23, 405
AMPELIDEÆ . 107
Amphicome
emodi, Lindl. 303
ANACARDIACEÆ 3.
14, 123
Andrachne
cordifolia, Muell.
Arg 356
Andromeda
ovalifolia, Wall 257
Andropogon '
Nardus. Linn 424

obtustiobs, Don . 31

Anemone

rivularis, Ham 81	adscendens, Rozb. xti, 409	umbellata, Wall 4
vitifolia, Ham 31	filicinus, Ham 409	Vulgaris, Linn. 4
ANGIOSPERM3 1, 2-24,	racemosus, Willd 409	var. ætnensis, sp.,
27-424	Aspidopterys	Presl 4
Anogeissus	lanuginosa, A. Juss. 71	Presl 4 Berchemia 10
latifolia, Wall 210	nutans, A. Juss 70	Edgeworthii, Law-
Anona	nutans, Hook. f 71	son. 105
reticulata, Linn 36	Wallichii, Hook. f. 70	floribunda, Brongn. 10
squamosa, Linn 36	ASTERALES 16, 248	lineata, DC 100
ANONACEÆ 2, 10, 35	Atylosia	Betula 39
Anthisteria	mollis, Benth 164	acuminata, Wall.'. 390
gigantea, Cav. 424	scarabsoides, Benth. 164	alnoides, Ham 390
Anthocephalus	Azadirachta	Bhospattra, Wall 39
Cadamba, Miq 240	indica, A. Juss 83	utilis, Don. 255, 39
Antidesma		BETULE . 394, 395
diandrum, Roth . 352	Baliospermum	BIGNONIACEÆ 5, 19
APETALÆ 1, 6, 20-22,	axillare, Bl 357	301
323-404 APOCYNACEÆ 5, 18, 275	Bambusa 418	Bischofia (Bischoffia)
AQUIFOLIACEÆ 1,3, 13,	arundinacea, Willd.420	javanica, Bl 351
87	nutans, Wall. , 419	BIXACEÆ 1, 2, 10, 48
ARACEÆ . 7, 24, 414	BAMBUSEA 415	Boehmeria 379
ARALES . 24, 414	Barleria	macrophylla, Don 380
Aralia	cristata, Linn 810	platyphylla, Don . 381
cachemirica, Dene. 223	strigosa, Willd 310	Var. scaprena,
ARALIACEÆ 4, 15, 223	Barringtonia	Wedd 381
Ardisia	acutangula, Gærtn. 216	rugulosa, Wedd 380
humilis, Vahl 258	Bassia 259	Bombax
Argyreia	butyracea, Roxb 260	malabaricum, DC. 58
Roxburghii, Chois 298	latifolia, Roxb 260	BORAGINACEÆ 5, 19,
Artemisia	Bauhinia 169	_ 294
Vulgaria, Linn 250	malabarica, Roxb. 170	Bosia
ARTOCARPEA 358, 359, 366	purpurea, Linn 172	Amherstiana,
Artocarpus	racemosa, Lam 169	Hook. f 324
integrifolia, Linn 379	retusa, Ham 170	Boswellia.
Lakoocha, Roxb 379	Vahlii, W. & A 171	serrata, Roxb 81
Arundinaria . 417	variegata, Linn 172	thurifera, Coleb 81
falcata, Nees . 417	BERBERIDACEÆ 2, 10,	Bridelia (Briedelia) 345
Falconeri, Benth 418	38	montana, Willd 346
jaunsarensis, Gam-	Berberis 39	retusa, Spreng 345
ble 418	aristata, Roxb 41	Broussonetia
spathiflora, Trin 417	Var. floribunda,	papyrifera, Vent. 366
Arundo	Wall 42	Buchanania
Donax, Linn. 424	asiatica, R . 42	latifolia, Roxb 129
ASCLEPIADACEÆ 5, 18,	coriaria, Royle . 42	Buddleia 292
282	Lycium, Royle . 42	asiatica, Lour 293
Asparagus 408	nepalensis, Spreng. 40	paniculata, Wall. 292

BURSERACAÆ 1, 8, 12,	Carissa	Cinnamomum . 326
Butea . 80	Carandas, Linn 277	
f frondosa, Roxb 155.	diffusa, Roxb 276	
r frondosa, <i>Rozo</i> 155, 887	spinarum, A. DC 276	
Buxus	Carpinus 398	
sempervirens, Linn.	faginea, Lindl 399	
344	viminea, Wall. 399	
CASALPINEAS . 135, 164	CARYOPHY LLALES 10,	
Caesalpinia 165	50	donument I'm 70
Bonducella, Flem. 165	Caryopteris 318	medica, Linn 77
sepiaria, Roxb 166	grata, Benth 318	Clausena
Calamus	Wallichiana, Schauer 319	pentaphylla, DC. 77
tenuis, Roxb 412	Casearia 221	Wampi, Blanco . 77
Callicarpa	graveolens, Dalz 222	Clematis 27
macrophylla, Vahl 311	tomentosa, Roxb. 222	acuminata, DC 30
Calosanthes	Cassia	barbellata, Edgew. 29
indica, Bl 301	Fistula, Linn 166	Buchananiana, DC. 80
Calotropis 285	mimosoides, Linn. 168	connata, DC 29
Acia, Ham 286	occidentalis, Linn., 167	Gouriana, Rozb 29
gigantea, R. Br 285	Tora, Linn 167	grata, Wall 30
procera, R. Br 286	Catamixis	montana, Ham 28
CALYCIFLORÆ 1, 4,	baccharoides, Tho. 250	napaulensis, DC 28
14-16, 135-230	Cedrela 84	nutans, Royle. F. 80
Camellia	serrata, Royle . 85	puberula, H. f. & Th. 29
Thea, Link . 54	Toona, Roxb 85	Clerodendron . 316
theifera, Griff 54	Cedrus	infortunatum,
Cannabis	Deodara, Loud. , 432	Gærtn 316
sativa, Linn 385	Libani, Barrel. 432	serratum, Spreng 316
CAPPARIDACE Æ 2,10,43	var. Deodara. 432	Siphonanthus, Br. 317
Capparis 43	H. f.	Cocculus 36
horrida, Linn. , 44	CELASTRACE Æ 1, 8, 13,	laurifolius, DC 37
sepiaria, Linn. 45	89	Villosus, DC 37
spinosa, Linn 44	CELASTRALES 13,89	Cochlospermum
CAPRIFOLIACE & 5, 16,	Celastrus 93	Gossypium, D.C 46
Capsicum 300	acuminata, Hook. f. 95	Coffea
Caragana	montana, Roxb 95	arabica, Linn 246
brevispina, Royle 144	paniculata, Willd. 93	bengalensis, Roxb. 246 Coix
Gerardiana, Royle 144	Royleana, Wall 94	Lachryma-Jobi, Linn.
Carallia	rufa, Wall. 94	xili, 423
integerrima, DC. 206	spinosus, Royle . 94	Colebrookia
lucida, Roxb. 206	CELTIDEAS . 358, 360	oppositifolia, Smith 320
Careya	Celtis	Colocasia
arbores, Roxb. 214	australis, Linn 360	Antiquorum, Schott 414
herbaces, Rozb 215	CHENOPONDIALES 2, 323	COMBRETACEÆ 1, 4,
	020 (15, 207

Cambustum	Cryptolepis	Dendrocalamus . 420
Combretum	Buchanani, Rosm.	Hamiltonii, Nees &
decandrum, Roxb. 211	& Sch 284	Arn 422
nanum, Ham 211	Cudrania	strictus, Ness . 421
COMPOSITÆ 5, 16, 248	javanensis, Trecul.	Desmodium 146
CONIFERÆ . 7, 25, 425	•	Cephalotes, Wall 147
CONVOLVULACEÆ 5,	Cupressus	concinnum, DC 151
19, 297	sempervirens, Linn. 427	
Corchorus	torulosa, Don . 427	floribundum, G. Don 150]
	CUPULIFERÆ . 394	gangeticum, DC 151 gyrans, DC 150
Cordia 294	Curcuma	6 ,,
Myxa, Linn 295	longa, Linn 405	var. Roylei,
Vestita, H. f. & Th. 295	Cuscuta	W. & A.? . 150
Coraria	reflexa, Roxb. 299	laburnifolium, DC. 148
	Cyclostemon	latifolium, DC 149
CORIARIACE E I, 3, 14,	assamicus, Hook. f. 850	laxiflorum, DC 150
132	Cydon'a 220	parvifolium, Baker. 151
CORNACEÆ 4, 16, 226	CYPERACEÆ 7, 24, 415	pulchellum, Benth. 148
Cornus 228	Destalence	sambuense, DC 150
capitata, Wall 228	Dædalacanthus	tiliæfolium, G. Don 149
macrophylla, Wall. 228	nervosus, T. Anders. 310	triquetrum, DC 148
oblonga, Wall 229	Dalbergia 160	Deutzia 202
CORYLEAR . 394, 398	hircina, Ham 162	corymbosa, Br. 202
Corylus	lanceolaria, Linn. 161	staminea, Br 203
colurna, Linn 399	latifolia, Roxb 161	DICOTYLEDONS 1, 2-6
Costus	paniculata, Roxb 162	9-22, 27-404
speciosus, Sm 406	sericea, G. Don . 162	Dillenia
Cotoneaster 4, 198	Sissoo, Roxh 160, 337	indica, Linn 82
acuminata, Lindl. 199	DAPH NALES 20, 325	DILLENIACE & 2, 10, 31
bacillaris, Wall 199	Daphne	Diospyros 262
Var. affinis, Lindl. 199	cannabina, Wall. 6, 332	cordifolia, Roxb. , 262
buxifolia, Wall 200	papyracea, Wall 332	Embryopteris, Pers. 264
microphylla, Wall. 200	Daphniphyllum	Kanjilali, Duthie xii, 263
multiflora, Bunge 200	himalayense, Muell.	Melanoxylon, Roxb. 264
nummularia, Fisch. 200	Arg 851	montana, Roxb. , 262
rosea, Edgew. , 199	Datura 300	tomentosa, Roxb 264
thymifolia, Hort. , 200	Debregeasia . 382	DIPTEROCARPACEÆ
Crategus	bicolor, Wedd 383	1, 2, 11, 55
crenulata, Rozb 197	hypoleuca, Wedd 383	DISCIPLORÆ . 1, 3,
Pyracantha, Pers. 197		12-14, 69-184
Cratmya	velutina, Gaud 383	Dodonæa
religiosa, Forst 45	1	viscosa, Linn 119
Crotalaria 188		Dregea
	Delphinium	volubilis, Benth 290
serices, Rets 138	·	EBENACEÆ 5, 18, 261
tetragons, Rozb. 189	· · · · · · · · · · · · · · · · · · ·	EBENALES . 17, 258

Echinops	lacerus, Ham 91	religiosa, Linn. 371
echinatus, DC 250	pendulus, Wall	retusa, Linn 370
Ehretia 296	tingens, Wall 90	var. nitida Thund, 370
acuminata, R. Br. 296	Euphorbia 342	Rexburghii, Wall. 377
lævis, Roxb 297	Nivulia, Ham 343	Rumphii, Bl 371
serrata, Roxb 296	Royleana, Boiss 343	sæmocarpa, Miq 874
ELÆAGNACEÆ 6 21,333	EUPHORBIACE & 1, 6,	scandens, Rozb 375
Elæagnus 333	21, 340	trachycarpa, Mig. , 878
latifolia, Linn 334	EUPHORBIALES 21,340	tuberculata, Wall 874
umbeliata, Thunb 334	Eurya	virgata, Boxb 876
Elæodendron	acuminata, DC. 53	Flacourtia 47
glaucum, Pers 95	japonica, Thunb. 53	Cataphracta, Rocb. 47
Raxburghii, W. & A. 95	Execcaria	Ramontchi, L'Herit 47
Elsholtzia	insignis, Muell.	Flemingia 157
polystachya, Benth. 321	Arg 356	Chappar, Ham 158
Embelia	sebifera, Muell.	congesta, Roxb 159
robusta, Roxb 257	Arg. 855	Var. semialata,
Engelbardtia	TACACT TO CO. CO.	Roxb 159
Colebrookiana, Landi.398	FAGACEÆ . 6, 22, 394	paniculata, Wall 158
•	,	prostrata, Rozb 160
Ephedra 405	Arnottiana, Miq. 871	semialata, Rosb 159
vulgaris, Rich. 425	bengalensis, Linn. 369	stricta, Rozb 159
ERICAGE . 5,17, 251	Carica, Linn 376	strobilifera, R. Br. 158
ERICALES, 17, 251	clavata, Wall 373	Flueggea.
Eriobotrya	cordifolia, Boxb 371	microcarpa, Bl 349
japonica, Lindl 200	Cunia, Hom. 375	Fraxinus
Eriophorum	elastica, Roxb 369	floribunda, Wall. , 271
comosum, Wall 415	foveolata, Wall 375	
Erythrina.	gibbosa, Bl 868	GAMOPETALÆ 1, 5,
suberosa, Roxb. 153	var. parasitica,	16-20, 231-322
var. glabrescens,	sp., Kanig. 368	Gardenia
Prain 154	,, tuberculata,	turgida, Roxb 244
Rucalyptus 215	sp., Roxb 369	Gardneria
citriodora, Hooker. 216	glaberrima, Bl 370	angustifolia, Wall. 293
globulus, Labill . 215	glomerata, Roxb 378	Garuga
tereticornes, Smith 216	heterophylla, Linn. 373	pinnata, Rozb. 81
Eugenia 212	hispida, Linn 374	GENTIANALES 18, 266
Jambolana, <i>Lam</i> . 213	infectoria, Roxb 872	Gerbera
Jambos, Linn 214	var. Lambertiana,	lanuginosa, Benth. 250
operculata, Rosb 113	Sp. Mig 873	Girardinia
Buonymus . 90	nemoralis, Wall 876	heterophylla, Done. 885
echinatus, Wail 92	var. Fieldingli,	GERANIALES 12, 69
Ambriacus, Wall. 91	Miq 376	Glochidion 847
frigidus, Wall 91	palmata, Forek 376	lanceolarium, Dals. 848
Hamiltonianus, Wall. 92	paraeitics, Konig . 868	velutinum, Wight . 848

OF EDITOR TO 04	Heptapleurum	Ilex 87
GLUMIFLORÆ 7, 24, 415-424	Venulosum, Seem 224	dipyrens. Wall 89
	Heteropanax	excelsa (exaulca),
Glycosmis pentaphylla, Correa 74	fragrans, Seem 225	Wall 88
Gmelina	Heterostemma	odorata, Ham 89
arborea, Linn 314	alatum, Wight , 289	ILICINEÆ . 87
GNETACE & 7, 25, 425	Hibiscus	Indigofora 139
Gongronema	esculentus, Linn 59	atropurpurea, Ham. 140
nepalense, Done 287	mutabilis. Linn 59	Dosus, Ham 142
Gossypium	Rosa-sinensis, Linn. 59	Gerardiana, Wall 140
barbadense, Linn. 59	syriacus, Linn 59	Var. heterantha , 140
herbaceum, Linn. 59	Hippophaë	hebenetals, Benth. 141
Gouania	rhamnoides, Linn. 334	heterantha, Wall. 140
leptostachya, DC. 106	salicifolia, Don 335	necessary is not a see
GRAMINE # 7, 24, 415	Hiptage	pulchella, Rossb 141
Grewia . 64	Madablota, Gærtn. 70	Inula
asiatica, Linn 66	Holarrhena	Cappa, DC 249
Var. vestita, Wall. 67	antidysenterica.	1
elastica, Royle . 66	Wall 278	cuspidata, Clarks . 249
bevigata, Vahl . 68	Holbœllia.	bona-nox, Linn. , 299
oppositifolia, Roxb. 65	latifolia, Wall. , 89	Ischæmum
polygama, Rozb 68	var. angustifolia,	angustifolium, Hack. 423
sapida, Roxb. 67	Wall 39	Itea
scabrophylla, Roxb. 67	var. latifolia, Wall. 39	nutans, Royle . 204
selerophylla, Roxb. 67	Holmskioldia	nucaus, noyas . 204
vestita, Wall 65	sanguinea, Retz 317	
GUTTIFERALES 11, 51	Holoptelea	Ya
Gymnema	integrifolia, Planch 360	Jasminum 267
tingens, W. & A 286	Houttuynia	arborescens, Willd. 208
GYMNOSPERMS 1, 7, 25,	cordata, Thunb 324	Var. latifolia,
424-495	Hovenia.	Rozb 269
Gymnosporia acuminata, Hook 95	dulcis, Thunb 105	dispermum, Wall 269
montana, Boxb 95	Hydrangea	grandiflorum, Linn. 270
Royleana, Wall 94	altissima, Wall 201	hirsutum, Willd 268
ru/a, Wall 94	Hymenodictyon	humile, Linn. 5, 266,
, w, w, w dan	excelsum, Wall 240	267, 269
1	HYPERICACE & 2,11,51	officinale, Linn 269
Hamiltonia	Hypericum . 51	pubescens, Willd 268
suaveolens, Rozb 247	cernuum, Roxb 52	revolutum, Sime 269
Bedera	patulum, Thunb 52	Jatropha
Helix, Lina 225		Curcas, Linn. 362
Helicteres	1	JUGLANDACE # 1, 6,
lsor, Linn 62	Ichnocarpus	22, 392
Helinus	fragrans, Wall 281	Jugians
ianceolatus, Brandie 107	frutescens, Br 281	regia, Linn 392

	Ligustrum	Machilus 326
macropoda, Boiss 428	compactum, Hook.	Duthiei, King mes. 327
recurva, Ham 428	1. & Th 274	Gamblei, King mes. 327
Var. squamata,	LILIACEÆ 7, 23, 406	odoratissima, Ness 327
Parlat 428	LILIALES . 23, 406	Mæsa
en	Lilium	indica, Wall 256
Kydia.	giganteum, Wall 410	MAGNOLIACEÆ 2, 10, 32
calycina, Roxb 57	Limonia.	Mallotus
	acidissima, Linn 75	philippinensis,
LABIATÆ . 5, 20, 320	crenulata, Roxb. 75	Muell. Arg 353
Lagerstræmia . 219	LINACE & . 1, 3, 12, 69	MALPIGHIACEÆ 1,3,12,
Flos-Reginse, Retz 220	Linociera	MALVACEÆ 1, 2, 11, 56
indica, Linn 219	intermedia, Wight xii,	MALVALES 11, 56
parviflora, Rozb 219	272	Mangifera
LAMIALES 19, 310	Litsæa . 6, 329	indica. Linn. 129
Lantana	chinensis, Lamk 329	Maoutia.
Camara, Linn 319	elongata, Wall 330	Puya, Wedd 384
indica, Rosb. 319	lanuginosa, Nees . 331	Marlea
LAURACEÆ , 6, 21, 325	polyantha, Juss 330	begoniæfolia, Roxb. 227
Lawsonia	sebifera, Pers 329	Marsdenia 287
alba, Lamb 218	umbrosa, Nees . 331	Roylei, Wight . 288
Lecythea	zeylanica, Neos . 331	tenacissima, W. & A. 288
salicina, Lev. , 389	LOGANIACE & 5, 18, 292	MELASTOMACEÆ 4, 15,
Leea 111	Lonicera 234	Melia.
alata, Edgew 112	alpigena, Linn. 236	Azadirachta, Linn. 83
aspera, Edgew 112	angustifolia, Wall. 235	Azedarach, Linn. 83
aspera, mayou.	orientalis, Lamk. 236	indica, Juss 83
LEGUMINOSÆ 4, 14, 135	purpurascens, Hook.	MELIACE Æ 1, 3, 12, 82
Leptadenia	quinquelocularis,	Meliosma 122
reticulata, Wight . 290	Hardwick . 236	dilleniæfolia, Bl 123
Leptodermis	LORANTHACEÆ 1, 8,	pungens, Wall 123
lanceolata, Wall 247 Lespedeza 144	21, 335	Memecylon 216
Lespedeza . 144 eriocarpa, DC. 145	Loranthus 1,386	MENISPERMACEÆ 2,
Var. Falconeri,	cordifolius, Wall 337	Mentha 10, 36
Prain 145	ligustrinus, Wall. 336	piperita, Linn 322
macrostyla, Baker . 145	longiflorus, Desr. 337	sativa, Linn. 322
serices, Mig. 145	pulverulentus,	Meriandra
stenocarpa, Maxim. 145	Wall 337	strobilifera, Benth. 322
Lettsomia	Scurrula, Linn 336	Michelia.
Thomsoni, Clarke , 299	vestitus, Wall 337	Champaca, Linn 33
Leucomeris	Lycopersicum . 300	Miliusa
spectabilis, Don . 248	LYTHRACE # 4, 15, 217	velutina, H. /. & Th. 35
Leycosteria	Macanana	Millettia
formosa, Wall. 237	Macaranga indica, Wight . 354	auriculata, Baker . 142
-valuation, 17 time 207	tuutes, fr tyme . OUT	

Millingtonia	Nicotiana 800	Periploca
hortensis, Linn 303	Nyctanthes	calophylla, Falc 284
Mimosa	Arbor-tristis, Linn. 270	Persea 328
pudica, Linn 174		PERSONALES 19, 301
rubicaulis, Lam 174	Ocimum	Petalidium
MINOSEÆ .1, 135, 173	sanctum, Linn 322	barlerioides, Nees . 309
Mimusops	Odina 100	PETALOIDEÆ 7, 23,
Elengi, Linn 261	Wodier, Roxb 130	405-410
hexandra, Roab 261	OLACACEÆ .1, 3, 18, 86	Philadelphus **
MONOCOTYLEDONS 1,	OLACALES . 12,86	coronarius, Linn 203
7, 28-24, 405-424	Olax	Phlogacanthus
MOREA . 358, 362	nana, Wall 87	thyrsiflorus, Nees 308
Moringa.	Olea 273 cuspidata, Wall 273	Phœbe
pterygosperma,		lanceolata, Nees . 328
Gærtn 134	ferruginea, Royle . 273	Phoenix 411 acaulis, Buch 411
MORINGACE Æ 8, 14, 133	glandulifera, Wall. 274	acaulis, Buch 411
Morus 364	OLEACEÆ . 5, 18, 266	humilis, Royle . 412
alba, Linn 364	Oroxylum /	sylvestris, Ràzb 412
indica, Linn 365	indicum, Vent. 225, 301	Phragmites
serrata, Rozb 365	Orthanthera	communis, Trin 424
Mucuna 152	viminea, Wight . 291	Karka, Trin 424
atropurpurea, DC 152	Osbeckia	Phyllanthus
capitata, W. & A 153	chinensis, Linn 217	Emblica, Linn 346
imbricata, DC 153	stellata, Wall 216	lanceolarius, Muell.
pruriens, DC 153	Osyris	Arg 348
Murraya 76	arborea, Wall 340	nepalensis, Muell.
exotica, Linn 76	Ougeinia	Arg 348
Konigli, Spreng 76	dalbergioides, Benth. 146	parvifolius, Ham 349
Musa	Pæonia	Physalis 300
sapientum, Linn 405	emodi, Wall 31	Picea.
MYRICACEÆ 6, 22, 385	PALMÆ . 7, 24, 410	Morinda, Link 433
Myrica	PALMALES . 24, 410	Picrasma
Nagi, Thunb 385	PAPILIONEM 135, 136	quassioides, Bennett 80
sapida, Wall 385	PARIETALES 10, 43	Pieris
Myrsine 256	PASSIFLORALES 15,	ovalifolia, D. Don 251,
africana, Linn. 257	221	253
semiserrata, Wall 257	Pavetta	Pinus 430
MYRSINACEÆ 1, 5, 17,	indica, Linn 245	excelsa, Wall 430
255	Var. tomentosa.	Gerardiana, Wall. 431
MYRTACE # 1, 4, 15, 212	Roxb 245	longifolia, Roxb 431
MYRTALES 14, 206	tomentosa, Smith . 245	Piper
Nephelium	Pentapanax	Betle, Linn.'. 324
Litchi, Camb 120	parasiticum, Seem. 224	brachystachyum,
Norium	Pergularia	Wall 325
odorum, Solund 280		longum, Linn 324
	, ,, , w	·

PIPEBACEÆ 6, 20, 824	Prinsepia ~	RANALES . 10,27
PERALES 20, 324	utilis, Royle 187	Randia 242
'iptanthus	Prunus 185	dumetorum, Lamk. 244
nepalensis, D. Don 137	armeniaca, Linn 186	tetrasperma, Benth.
oistacia	Cerasus, Linn 187	& Hook. f 243
integerrims, Stew. 128	communis, Hudson	uliginosa, DC 243
PITTOSPORACEÆ 48	Var. insititia . 187	RANUNCULACEÆ 1, 2, 10, 27
Pittosporum . 49	Padus, Linn 186	Rauwolfia 10, 27
eriocarpum, Royle . 50	persica, Benth 186	
floribundum, W. &	Puddum, Roxb 185	serpentina, <i>Benth.</i> . 282 Reinwardtia
A 49	Psidium . 215, 220	
Plecospermum	Guava, Raddi 215	trigyna, Planch 69
spinosum, Trecul . 363	Pterospermum	RHAMNACE & 1, 3, 13, 96
Plectranthus	acerifolium, Willd. 62	Rhamnus 102 dahuricus, Pall 104
rugosus, Wall 322	lanceæfolium, Roxb. 63	
ternifolius, Don 322	Pueraria	persicus, Boiss 103
Plumeria .		procumbens, Edgew.105
acutifolia, Poiret . 282	1	purpureus, Edgew . 104
∂odophyllum	Punica	triqueter, Wall. 105
emodi, Wall 43	Granatum, Linn 220	virgatus, Roxb 104
Pogostemon	Putranjiya	RHIZOPHORACEÆ. 4, 15, 206
parviflorus, Benth. 322	Roxburghii, Wall., 349	Rhododendron . 252
plectranthoides,	Pyrus 4, 195	Anthopogon, Don 254,
Des/ 322	Aria, Ehrh 196	896
POLEMONIALES, 19,	communis, Linn 197	arboreum, Sm. 252, 253
294	foliolosa, Wall. 197	campanulatum, Don 254
POLYGALES. 10, 48	lanata, Don 196	lepidotum, Wall 254
POLYPETALÆ 1, 2-4,	Malus, Linn 197	Rhus 124
9-16, 27-230	Pashia, Ham. 195	Cotinus, Linn 125
Populus	variolosa, Wall. 195	parviflora, Roxb 125
ciliata, Wall. , 391	ursina, Wall. 197	punjabensis, Stew. 126
Porana		semi-alata, Murray 126
paniculata, Roxb 298	QUERCINEAS 394, 400	succedanea, Linn. xii.
Potentilla	Quercus 400	127
fruticossa, Linn. , 200	ahnulata, Sm 403	vernici/era, DC 127
Pouzolzia	dilatata, Lindl 402	Wallichii, Hook. f 127
viminea, Wedd 381	glauca, Thunb 403	Rhynchosia
Premna 313	incana, Roab. 252, 253,	pseudo-cajan, Camb. 157
barbata, Wall 314	402	Ribes . 4, 204
herbacea, Roxb. 314	semecarpifolia, Sm. 401	glaciale, Wall 204
latifolia, Roab 313	serrata, Thunb 404	rubrum, Linn 205
var. mucronata.	QUERNALES 22, 892	Ricinus
Roch 313	•,	communis, Linn 357
	Quiaqualis	Rivea
PRIMULALES 17, 255	indica, Linn 24	ornata, Chois 298

Rosa 4, 19	8 Santalum	Siegesbeckia
macrophylla, Lindi.	album, Linn 340	
var. minor, Lindl. 194		SIMARUBACEÆ 3. 12
moschata, Mill 194		71
sericea, Lindl 194		.)
BOSACEÆ . 4, 14, 184		
ROSALES . 14, 135	detergens, Rozb 115	
Roylea	Mukorossi, Gærtn 115	
elegans, Wall 321	Sapium 355	
RUBIACE #8 5, 16, 237	insigne, Benth 356	
RUBIALES . 16, 231	sebiferum, Roxb 355	
Rubus 189	SAPOTACEÆ 5, 18, 258	prolifera, Rozb 407
bistorus, Buch 192		vaginata, Dene 408
biflorus, Ham. 192		
ellipticus, Sm 191	saligna, Muell. Arg. 848	Solanum
fapus, Ham 191		indicum, Linn 300
lasiocarpus, Sm. 192	napaulensis, DC 54	Melongena, Linn 300
macilentus, Camb. 191	Saxifraga	tuberosum, Linn 300
niveus, Wall 190	ligulata, Wall 205	verbagcifolium,
paniculatus, Smith 190	SAXIFRAGACEÆ 4, 14,	Linn 300
RUTACEÆ 1, 3, 12, 71	201	Sophora,
Sabia 121	Schizandra . 2,83	mollis, Grah 162
campanulata, Wall. 121	grandiflora, Hook. f.	SPADICIFLORÆ 7, 23, 410-414
paniculata, Edgew. 122	& Th 34	Spatholobus
SABIACEÆ 3,14, 121	propinqua, Hook. /.	Roxburghii, Benth. 154
Saccharum , ,	& Th 84	Spiræa 187
arundinaceum, Retz. 423	Schleichera	bella, Sims 188
Sageretia	trijuga, Willd 114	canescens, Don . 189
oppositifolia,	Scindapsus	sorbifolia, Linn 188
Brongn 108	officinalis, Schott . 414	Vaccinifolia, Don . 189
SALICACE # 5, 22, 386	SCITAMINEÆ 7, 23, 405	Spondias
Salix 387	Securinega	mangifera, Willd 132
acmophylla, Boiss. 888	obovata, Muell. Arg. 349	Sponia
alba, Linn 388	Semecarpus	orientalis, Planch 361
babylonica, Linn 389	Anacardium, Linn. /.131	politoria, Planch 362
daphnoides, Villars 390	Sesbania	Staphylea
elegans, Wall 389	mgyptiaca, Pers 143	Emodi, Wall 120
flabellaris, Anders 391	Shorea	Stephania
Lindleyana, Wall 391	robusta, Gærtn 55	rotunda, Lour 38
tetrasperma, Roxb. 387	Shuteria .	Stephegyne
Wallichiana, Anders.390	vestita, W. & A 164	parvifolia, Korth. 239
AMYDACEÆ 1, 4, 15,	Sida	Sterculia . 60
221	carpinifolia, Linn. 59	fulgens, Wall 61
ANTALACEÆ 6, 21, 339	cordifolia, Linn 59	pallens, Wall 61
ANTALALES 21, 885	rhombifolia, Lina. 59	Villoss, Rozb 61

	-21
STERCULIACE # 1, 2, THALAMIPLORM	1 Engrave
	1, URTICALES. 22, 357
	38 URTICEA 358, 859, 879
	7 Vallaris
18g Tools	dishetems W. 11
asper, Lour.	dichotoma, Wall 279
Total Controlled	Heynei, Spreng 279 Ventilago
MINGUE, Nece	
ungustifous, Clarke 307	calyculata, Tulasne 97 Verbena
atropurpureus, Ness 308	
- 11.00 trees . 300	
Daihousianus, Thysanoleena	VERBENACEÆ xiii, 5,
Clarke . Agrostis, Ness . 423	20, 310
pentstemonoides, TILIACEÆ . 2, 11, 68	vernonia
T. Anders. inospora	woxburghii, Less. 249
Wallichii, Nees cordifolia, Miera 36	Viburnum 231
STYRACEÆ 1, 5, 18, 265 「oddalia	coriaceum, <i>Bl.</i> . 233
Symplocos aculeata, Pers. 73	cotinifolium, Don 232
crategoides, Ham. 265 Trachelospermum	icetens, Done. 234
Syringa fragrans, Hook. f 281	nervosum, Don . 238
Emodi, Wall. 270 Trema 361	stellulatum, Wall. 232
Tabernæmontana orientalis, Bl 361	villedrunea.
eoronaria, Br. 278 Politoria, Planch 362	rutescens, Bl. 382
Tamarindus Trewia	Viscum 338
indica, Linn 168 nudifiora, Linn. 314, 353	album, Linn 338
TAMARICACEÆ 1, 2, 11, Tylophora	articulatum, Burm. 339
50 toppie 22	articulatum, Burm.
Tallaria mana	(Brandis) . 339
diolog, 1020.	attenuatum, DC 339
TVDU ACTOR TO A COLUMN	japonicum, Thunb. 339
	VITACEÆ 1, 3, 12, 13, 107
Tectona.	Vitex
grandis, Linn. 812 ULMER 358, 359	Negundo, Linn 315
Tephrosia Ulmus	var. incisa, Lam. 315
candida, DC. 143 integrifolia, Roxb. 360	Vitis 108
Terminalia . 207 Wallichiana, Planch 359	capriolata, Don. 111
Arjuna, Bedd 210 UMBELLALES . 15, 223	himalayana, Brandis
belerica, Roxb. 208 Uraria	110
Chebula, Retz. 208 hamosa, Wall. 163	lanata, Roxb 110
tomentosa, W. & A. 209 lagopus, DC 163	latifolia, Rozb 109
TERNSTREMIACEÆ picta, Desv 163	parvifolia, Roxb. 110
Tetradenia 1, 2, 11, 52 Urena Iohata Finn	repanda, W. & A. 109
Tetranthene 529 10000, 2000.	rugosa, Wall 109
Insmitalia 7	semicordata, Wall.
	var. Roylei, King 110
monopetala, Roxb. 330 URTICACE & 6, 22, 357	vinifera, Linn 110
	. , , 410

Wendlandia . 241 exerta, DC 241 puberula, DC 242 Wikstroemia canesens, Moissn. 332 virgata, Meissn 333	tomentoss, Roem. & Sch	Zingiber officinale, Rosc. 405 Zizyphus 98 Jujuba, Lam. 98 Cenoplia, Mill. 100 oxyphylla, Edgew. 99
Woodfordia	Zanthoxylum	rugosa, Lam. 101
floribunda, Salisb. 217	alatum, Roxb 72	xylopyra, Willd. 100

INDEX TO EUROPEAN AND VERNACULAR NAMES.

*** The letters affixed to names denote the localities or languages to which they belong. Thus As. stands for Assam; B. for Bengal; D. for Dehra Dún; E. for English or European, also for Eastern; G. for Garhwal; H. for Hindi or Hindustani; J. for Jaunsar; K. for Kumaun; Ka. for Kálsi; Ma. for Málköt; Mu. for Mussoorie; N. 1. for Northern India; P. for the Punjab; R. for Rajpur; S. for Saháranpur; Sans. for Sanskrit; T. V. for the Tons Valley; U. 1. for Upper India; U. P. for the United Provinces of Agra and Oudh; and W. for Western.

Achhoi, J	. 192	Ámlá, H.	. 345	Arlů, S.		46
Adhuari, S	. 219	Amil, D.	. 352	Ārú, H.		186
Adrak, H	. 405	Amli, H.	168, 170	Árúsá, H.		309
Ageli, J.	. 31	Am-pich, D.	. 77	1		209
Áglá, D.	. 179	Amrúd, H.	. 215	1		300
Agla-bel, D		Anár, H.	. 220	Âyár, J.		408
Ailáh, H.	. 177	Anchhu, H.	. 191			
Ajhár, As	. 220	Anetá, D	. 70	Bábai, H.		428
Å k, <i>H</i>	. 286	Angáo, J	. 91			175
Akásbel, H.	. 299	Angáu, J.	. 91	Bádá, D.		388
Akás Nim., H	. 303	Angári, J	. 102			414
≨khōr, J.	. 392	Angári, D.	. 245	Bael, H.		78
Akhōtá, J.	. 223	Angur-ki Bel, B		Bael tree, E.		78
Ákhröt, H.	. 392	Anjır, D.	. 376	Baherá, H.		208
	. 227	Ánjiri, U. P.	. 376	Báib, H.	-	423
11 0	. 174	Ankora, H.	. 227	Báigan, H.		300
Alai, D.	. 166	Anwin, J.	. 348	Báingan, H.		300
Aláy, D.		Ányar, J.	. 251	Bains, G.		257
£14		Áola, H.	. 345	Bair-ra, Ma.		304
A 1.4 77		Aonlá, H.	. 345	Bairolá, E. D		295
Alders, E.	. 300	Apple tree, E.	. 197	Bakáin, D.		83
Álú-bukhára, H.		Apricot, E.	. 186	Bakár, D.		, 314
Alticha, H.		Árandi, H.	. 357	Bakárchá, G.		, 314
S 77	. 187	Archoi, J.	. 127	Bákli, H.		210
Am, H		Ári, J.	144, 166	Báilon, J.		34
Ambi, D. & S.		1		Bambher, J.		320
Ambára, H.	. 129	Árjún, H.	. 210	Bamboos, E.		416
4 111 6		Árkhoi, J.	. 126			402
Amili C.	. 102	Árkhol, U. P.	. 127	Báná, H.		399

Banana tree, E	405	Bet, H 412	Bhút Kainju, J 227
	316	Bewal, D 65	Bhút-katáiá, H 300
Banchhúi, D	159	Bhábar, S 423	Bhutnoi, J 232
	360	Bhadeu, J 328	Biáon, J 391
	235	Bhadroi, J 338	Bichchhú, H 385
Bándá, H. 336, 337,	339	Bhainsh, H 387	Bilgár, D 76
Báni, J	40	Bhainshrá, J 390	Bill, H 78
	402	Bhainswáli-bel, D 152	Bimol, R 381
Ban Kapási, D	39	Bhambélá, J . 92	Bindá, Bindú, D. & G. 320
	113	Bhambéli, J 90	Bintá-lakri, S 320
Bánkli, H.	210	Bhamorá, G 229	Bird Cherry, E 186
Ban Nimbu, H.	74	Bhand Ber, <i>D</i> 101	Bismár, S 227
Bánoi, J	34	Bhander, D. & S 100	Bis Tendú, H 262
	, 421	Bhandir, H 183	Bistú, J 67
Bánsá, D	309	Bháng, H 385	Biul, J 65
	164	Bhánt, H 316	Biur, J 65
Ban Tamáků, D.	300	Bharárá, Ma 304	Blackwood tree, E 161
Dwa	257	Bharti, J 356	Blue Gum, E 215
Dunjun varry -	369	Bhartoi, J 356	Blue Pine, E 430
	369	Bhatiá, G 147	Box, E 344
	117	Bhattá, H 300	Brambles, E 189
Date Sections -	159	Bhaulan, D 240	Brinjal, <i>E</i> 300
Bará Siáru, b.	3 80	Bháunrá Kujoi, J 193	Broom-grass, E 423
Barberry, E	40	Bheáré, J 190	Budu, H 339
Darker, Tr.	369	Bheddá, J 200	Bullock's heart, E 36
Danier, and	379	Bhedrá, J 243	Búráns, J 253, 403
Bárna, S.1	45	Bhek, J 187	Búshá, J 123
DWINING	2 95	Bhekal, G 187	Búshkuá, J 123
Diametri, -	. 69	Bhekar, G 187	Cape-gooseberry, E. 300
Dagarent, a .	390	Bhekoi, J 187 Bhengoi, J 324	Camphor tree, E. 326
Distriction, 2010	241		Castor-oil plant, E. 357
Báuri, J .	44		Cedar, E 432
Bebar, G.	159		Chá, Cháh, H. 54
2004,	388		Chakrci, J 189
Behel, S.	. 6 5		Chakunda, H. 167
Bel, Il.	. 78 . 75	I	Chakutará, H 78
Beli, H.	281	TO 1 11 20 FO	Cháltá, H 32
Bel Kámů, D. & S.	298		Chalú, J 235
2 ,, 2 ,,	. 29	Bhojo, J 327 Bhondir, J 182	Chamári, D 348
Bel Kum, D.	. 29 . 29	Bhúj, G. & J 395	Chamba, J 137
Bel Kangu, D.	412	Bhúj-nali, J 237	Chambéli, J 270
Bent, H	98	Bhújpattra, H 395	Chambér, S 262
Beri, H.	98	Bháiroi, J 202	Chamboá, J 137
Beri, J.		Bhutiá Badám, H 399	Chamboi, J 332
Boti' A '		The Arte Theorem! Tr ann	,

Chaméli, H 26	8 Cowhage plant, F 153	3 Dheu, D
Chamkharik, H 39		
	3 Curry-plant, E 77	
Chamror, H 29		
Chamua, J 33		
Chandan, H 34	0	Dom Sál, H 35
Chandná, D 32	Dádu Bándá, D. 368	
Chándni, D 27	B Dádál, J 92	
Charcoal tree, E 36	Dahiá, S 362	Dúdhiá, D 293
Chatroá, J 4	Dáhlochi, J 203	Dudhi-bel, D. 279
Chatroi, J 42	Daiá, D. & G 311	Dúdh Kainju, J. 119
Chaulái, W. S. 241	70 11 11	Dúdhlá, G. & J 376
Chaurdha, G 104	1 75 41 1 4 4 5	D4 1111
Cháwna, K 384	l e	D-11
Cherry, E 187		Durlá, H
Chhauchra, E. D. 158	, , , , , ,	
Chhánchri, D.&G. 368,375	Dunda Diekar, G 237	Duthli, J 372
Chhátián, H. 277	Zando-ka Kama, J. 140	Ekdániá, S 345
Chhátimal, D 315	Dunoi, J	Elm, E. 359
Chhátwán, H . 277	243	Emroi, J. 359
Chhotá Gingárú, J. 243	320	Erandi, H
Chhoti Báshroi, J 389	Darin, Darioi, Dariu,J. 85	
Chhúnmúna, H. 138	Darunaid, H 40	Fagwára, P 376
Chichli, J 322	Darumaridra, Sans 40	Figs, E 366
0113 1 75 014	Dedwar, H 432	Fig tree, E 376
CT. II T	Dék, D 83	
CO 11 1 - 4 TV 400	Deknoi, J 83	Gáb, H 264
	Deodár, H 432	Gáia, D 257
•	Dec-Ningal, J. 417	Gaild, Gair, Ma 274
and and a second	Devadáru, Sans 432	Gambhar, H 314
	Devidiar, D. & S 427	Gamhar. D. 314,7353
Chitu, Hills 186 Chinese Tallow-tree, E. 355	Devidwar, D. & S 427	Gandhela, D 76
	Dewár, H 432	Gangára, T. V 133
		Gangeru, T.V 138
		Garh Kimu, D. 227
	Dhálá-ghás, D 424	Garlie, E 406
Chirla, D. 103	Dháman, H 65	Gar-tushiárá, K 382
Chitrá, J 120	Dháruá, J 92	Gauj, H 142
Chiura, D	Dháttrí, Sans 217	Gaunch, D 153
Chálá, Hills 186	Dháu, H 217	Gaunt, G. & D 105
Chúlù-ká Bándá, J 338	Dháulá, H 217	Gaunta, G 257
Chumá, U.P. 834	Dhaul Dhák, H 153	Gausam, H 114
Chúndri, D 323	Dhaul Khágshi, D 384	Gáyá, D. & G. 345
Chuntli, D 151	Dhaul-pedda, S 353	Geáng, J 235
Coffee shrub, E 246	Dhaura, Dhauri, D. 219	Gerjá, S
Common mint, E 322	Dhebri, H 95	Genthi, Genti, D. & G. 380
	,	weight, D. Of W. 380

-1. 14 B		084 (Harsingar, H. W 270	Jámroi, J 186
Ghogshá, D.	•	203	Hazár-muli, H. 409	Jámún, H 213
Ghagtai, J	•			Jangél, Jangéla, E. D. 95
Ghuina, H	•	414		Jangli Sharifá, Mu 39
Giloh, H.	•	38	Hemp, E	Jánú, J 306
Gingáru, J.		197	Hill Toon, E 85	Jarhphali, H 375
Ginger plant, I		405		Járúl, $E.B.$
Ginroi, J.		334	Himalayan— Buckthorn, E 104	Jatá Sálpán, H 148
Glotra, J	•	410		Javá, H 59
Gish, G.	•	399		Jhanjhorá, D. & S 169
Gobhá, D.	•	374 374	71 77 970	Jhár Beri, H 98
Goblá, H.		61	Elin, E 359 Hazel, E 399	Jháu, H 50
Godgudála, H.	•	54		Jhinghan, H 130
Goginá, H.	•	123	Holly, E 88 Honey-suckle, E 236	Jhinjhorá, D. & S 169
Goi, J.	•	250	Hornbeams, E 398	Jhiri, H 44
Gokhrů, H.	~	, 346	Pencil Cedar, E. 428	Jhirná, G 409
Gondai, S		417	1	Jhúlá, Jhúlú, G 250
Go-Ningal, J.	•	106	Tol.ma,	Jiápútá, H 349
Gonta, E. D Gophlá, Mu		39	DAITOL 2-11, — .	Jiban, B 361
	•	172	DPI dett, t	Jinghini, Sans 130
Goriáo, J. Gor Mártoi, J.	· ·	150		Jogiá Páderá, G.&K. 247
Gosam, H.	•	114	(IIII), 2.	Joi, G 270
Gowala Darim	. н	94	111110011, 01	Jugtér, Ma 70
Grasses, E.		415		Junipers, E 427
Guá Sál, G.		35	His, D 44 Hog-plum tree, E 132	1 1 1
Guava, E.		215	Hol-bali, J 269	Kabási, J 119
Gúggal, U.P.		438	l	Kachnár, D 172
Guirál, G.		172	Holly, E 88 Horse-chestnut tree,	Kadvi, G
Guláb Jám, H		214	E 113	Káem, H 239
Guláb Jamún,		214	Horse-radish tree, E. 134	Kácn, G
Gáláchin, Gála		. 282	Horse-radisa tree, 2. 20	Kaenth, J 195
Gular, H.		378	Imli, D. 170, 352	Kághzi-Báns, H 422
		38	Imli, H 168	Kágshi, J 228
Gul-1-ajáib, H.		59	Imroi, J 359	Kahu, H 273
Guloh, H.		38	Inái, J 403	Káil, H 430
Gumhar, H.		314	Indian Cork-tree, E. 303	Kainchli, J 119
Gánchi, Gánja	, Н	151	India-rubber tree, E. 369	Kainjal, J 117
Gúr-ándrá, J.		326	Injar, H 216	Kainjli, J 118
Gárbhéli, D.		67	Ivy, E 225	Kainju, J 117, 118
Gurhal, H.		59	Jack tree, E 379	Káint, J 195
Gurlpatá, J.		74	Jaent, H 143	Kálphal, H 385
Haldi, H.		405	Jalmálá, D 387, 388	Kákhri, H 370
Haidi, H.		238	Jáman, H 213	Kakkar, Kákroi, J 128
Har, Harath,	. Harb		Jámnoi, Jámoi, J 186	Kákrasingi, H 128
Harr, H.		. 208	Jamnuá, D 47	Káksa, D 374
i theiting.	•			

		771 - 14-1 77 449
Kakurchhá, J. 274	Karûi, J 80	Khajūri, H 411
Kálá Ánchhu, J. 190	Káshmal, J 40, 42	Khákshá, G 381
Kálá Bánsá, S 320	Kashmoi, J 40, 41, 42	Khákshá, J 228
Kálá Hinsálu, J. 192	Katári, D 48	Khákshi, D 362
Kálá Sákiná, G. 140	Kathál, Kathár,	Khális, D 44
Kálá Tendú, H 264	Н. 379	Khamhár, H 314
Kálhins, Kálhis, D 44	Kath Ber, D. & S 100	Khankri, H 370
Káli Ánchhi, D 192	Kath Bhemal, D 68	Khánoi, J 373
Káli-bel, D 97	Kath Bhilawa, D 129	Kharak, J. & G 360
Káli Dúdhi, H. 281	Kath Bhúj, J. 396	Kharak-chená, D 360
Káli Khatái, D 352	Katherá, J 105	Kharás, G 123
Kali Papri, S 360	Káthi, J 140	Khárchu, J 288
Kális, D 44	Kath Karanj, H 165	Khardál, S 362
Káli Siris, H 181	Kath Mauwa, G 348	Khardála, Ma 61
Kambel, J 354	Kathmorá, G. 201	Kharenti, D 59
Kándá, S 410	Káth Ním, H 76	Kharik, J. & G 360
Kandái, H 47	Kathoi, J 140	Kharpát, H 81
Kandár, J 113	Kath Semal, D 224	Kharshu, J 401
Kandár-(Báli), J 110	Kathúr-chará, J 74	Khat Papri, S 170
Kandei, H 47	Kathúr-kantá, J 144	Khatta Jhanjhora, D.170
Kandeiú, J 88	Katila, H 61	Khatta Jhinjhora, D. 170
Kandhára, D. 48	Katirá, H 46	Khatuá G 170
Kándur, J 113	Kau, J 273	Kheina, D 375
Kanér, H 280	Kaula, D 327	Khemri, D 376
Kángo, E. D 47	Kauloi, J 102	Khindra, Khinna.
Kángúli, Ma 30	Kaulu, D 327	Khinni, D. & G 356
Kánj, H 73	Kaunch, D 153	Khip, H 291
Kanjlá, J 118	Kaunera, G 183	Khirpi, D. G 356
Kántá Báns, H. 420	Kauni, J. 29, 30	Khirni, H 261
Kanthál, H 379	Kaunia-bali, J. 28	Khóru, J 40
Kapás, G 250	Káuni-báli, J. 29, 30	Khúni, G 150
Kapás, H 59	Kaunta, J 409	Khúnjú, D 145
Kapási, J 391, 399	Kawá Okhár, J. 112	Kiári, J 44
Kapást, S 62	Káwalá, J 327	Kidney Beans, E 138
Káphal, J 385	Kelá, H 405	Kikar, D 178
Kápni, H 317	Kelon, J 432	Kikar, S. & P 175
Karan, J 205	Khabar, H 371, 372	Kimú, J 385
Karanj, H 166	Khadbehúlá, K 350	Kingorá, D. & G. 41,42
Karánoi, J 321	Khágsha, J 228	
Karántá, H 284	Khágshi, D 362	Királa, D 166 Kirmolá, Kirmoli, G. 116
Karaunda, H 276	Khain, D 375	
Karha, Karhái,	Khair, H 177	110010, 01
Karhár, D 181	Khairwál, D 172	12011101, 01
Karká, Karkáwa, D. 330	Khairwál Pápri, S 172	22.00
Karú, D 316	Khájá, D. & G 345	ALOU DULLENG
Karái, D 318	Khajúr, H 411, 412	Kouloi, J 102

		194	Lodra, J 265 Maulsari, H	2	61
Kajol, J.		240		2	66
Kńkurkát, H.		431		. 3	393
Kulháin, G. & J.		143			62
Kulthi, D.		2 95	Loquat, E 200 Medhá-singhi, D	. 2	284
Kúm, S.	•	295	Loshtia, D 143 Mehál, D. & G	1	195
Kumpaiman, H.				2	18
Kúmbi, Kúmbhi, H	• •	314		2	240
Kumhar, H.		424		. 1	195
Kumria, G.		397		. 4	124
Kúnis, G. & J.		194		. 8	338
Kúnjo, G.		250	Mithiant 7		225
Kápherá, J.		278	Madár, H. 153, 285, 286 Mock Orange, E	. 2	203
Kúra, H.		362	Madn Maiti, H. Mohal D & C	. 1	195
Kurchná, S			Mahol, D. & G 100 Mohwé U		260
Kurri, D.		270	Marinda I		135
Kurmurá, J		182	Matini-Riter, 11.		102
Kurri, D.		362	Maida-lakri, H Mogroi /		133
Kusam, H.		114	main, J.		393
Kú shki, J	•	385	Maindal, Mainphai, H. 244 Mulhermes E		364
_		•	Maknota, J		423
I adies' finger, E.	•	59	Makon, S 100		133
Laduli, G.	٠	92	Majo, b.		
Lahsún, H		406	Marc Ballingoo, 27		166
Laila, H .		387	maina-out, D.		
Lájwanti, H		174		. 1	120
Lál Ánchhu, H.		191	Máljhan, H 171 Nák-chhikni, Ma.	•	30
Lái Jháu, H		50			424
Lálor, J.		306	1		222
Larkspur, E		31			78
Lassorá, Lassúrá,	Η.	295			197
Latkár, J		188			83
Latman, H		323		. :	385
Leauri, J		427		. :	141
Lemon, B		77			83
Leonsh, J		199			77
Leoushi, J		199,			125
Lessorá, H		295			418
Leuri, J .		427		. :	315
Lhish. J.		104	Mártoi, J 149 Noná, H		36
Lichhoi, J		91	Marua-bel, D. 288		400
Lichi, E. & H.		120	Maseum, Mu.		392
Lichkurá, G		. 249	Mashhol, J	•	59 59
Lime, E.		. 77	Masúri, Mu 133 Okra, E.	•	
Lödh, J .		265	Matol, J		406
Lodhra, Sans		265	Maula-bel, D 154 Orange, E	•	78

Pachnálá, D 47	Pewandi Ber, H 98	Puá, H 384
Padal H 302	Phájá, J 185	Pudiná, H 322
Páderá, G., J. & K. 247	Phaláma, G 48	Púla, Púli, Púlú, H. 57
Páderá, Ma 247	Phaldú, G 239	Pumelo, E 78
Páderái, J 247	Phálsá, H 66, 67	Púna, J.& H 296
Padam, H 183	Phálsá-Dháman, H. 66	Pútijiá, H 349
Pahári Eikar, S 176	Phalwárá, H 260	Puzálá, J 397
Pahári Pípál, H 391	Phanát, G 403	Rái, J 433
Pahári Shisham, S 355	Pharnát, E. D 301	Ráini, D 354
Páhi, Pai, J 196	Pharrái, E. D. 301	Rámálo, K 354
Pákhar, D 372	Phempri, G 222	Ram-dataun, U. P. 407
Palás, H 155	Pherú, J 376	Ramphal, H 36
Pán, H 324	Phiunli, J 52	Rangoon-creeper, E. 211
Pand, H 337, 339	Phirsau, D 68	Rasaunt, H 40
Pandárá, S 243	Phulei, Phuloá, H 260	Rashniá, J 233
Pandayan, D 296	Phulor, J 236	Ratanjot, H 77
Pándroi, J 190	Phúsára, Phúsiári, H.248	Ratendú, J 54, 351
Pangár, J 113	Piál, H 129	Ratgiri, D 151
Pángoi, J 116	Piáman, D 213	Ráunsh, J 199
Pániála, W. D. 95, 351	Piáz, H 406	Ráunshi, J 199
Páni-bel, <i>H</i> 109	Pílá Kanér, H 282	Red Currant, E 205
Panlú-ki Bál, J 110	Pilkhan, H 371	Richhoi, J 232
Panwar, D 167	Pilkháru, G 372	Rikhdálmi, G 257
Paper Daphne, E 332 Paper Mulberry, E 366	Pilkhoi, J. 371, 372	Rikhpetá, J 43
	Pindálú, Pindár, Pin-	Ringál, H 417
Pápri, J 344 Pápri, Ma 355	dorá, H 243	Ringál, J 418
Pápri S 169, 360	Pingniárá, J 52	Ríthá, H 115
Parand, K	Pinné, Ma 263	Rithoul, E. D. 317, 349
Parángá J 116	Pipal, H 371 Piplás, J 391	Roel, D 211
Parbia, H 38		Rohni, Roini, G 354
201	Pipti, H	Roi, J 433,
Parhá, D. 284 Parhá, D. 38	Pirlú, J	Roini, J 90
Parhé, D. & G 38	Pırlú, D. & S. 423	Rose-apple, E 214
Parphútá, G. 376	Piuli, Ma	Rosewood tree, E 161
Paterá, S 413	Piyál, H	Rúel, D 211
Pathoi, J 321	Plantain tree, E. 405	Ruinsh, J 199
	Plum tree, E 187	Ruinshi, J 199
	Poi, H	Busa-grass, E 424
Pemdi Ber, H. 98	Poidhaulá, K	Safed Ak, H 285
	Pomegranate, E 220	
	Poplar, E 391	
	Povia-bel, D 414	
	Potato, E 300	Safed-bel, S 298 Safed Siras, H 181
	Pothá, H	
		Safed Siris, H 181

INDEX TO EUROPEAN

Sáigún, <i>H</i>	. 312	Shilphara, J 205	Tantiá, G.	. 301
Sáin, D. & S	. 209	Shimálú, D 315	1	. 355
Sainjná, H.	. 134	Shiproi, J 399	1	225
Sákiná, G.	140, 162	Shisham, H 160	Tarlú, D.	301
Sákiná, D. & G.	. 140	Shobhanjana, Sans. 134	Tárwa, U. P.	. 334
8ál, H	. 55	Shunjai, J 269		312
Salái, Salár, H.	. 81	Shurur, J 331		. 54
Sálpán, H.	. 158	Siálu, D 48	Tejbal, H.	72
Sal tree, E	. 55	Siár, J 383	Tejpat, H.	. 326
Samálú, D	. 314	Siár, Ka	Telegraph plant, E.	
Sámri, D	. 250	Siárú, Mu 383	Temrú, J.	72
Sanaffar, H	. 216	Sia Tút, Sia Tunt, H. 365	Tendú, H.	264
Sandalwood, E.	. 340	Silk-cotton tree, E. 58	Tepári, H.	59
Sándan, H	. 146	Silver Fir. E. 434		229
Sanjná, H.	. 134	Simal, H 58	1	244
Sankru, H.	. 423	Simris, T. G 254	Thanthar, J.	104
Sann, H.	. 139	Sinár, J 383		148
Sanni, E. D.	. 138	Sinára, G 166	Thor, D.	343
Sansádu, J	. 344	Sirál, D. & S 156	Thúner, Thúniára, J.	
Sansárú, E. D.	. 383	Siran, 7		343
Sausoi, Ka.	. 373	Siras, Siris, H 180		213
Sáoni, H.	. 219	Sirli, G. & J. 431	Tibri, J.	126
Sarag-báli, J.	. 299	Sirs, Sirsá, H 180		391
Sarol, J. & G.	. 431	Sissú, H 160, 355		343
Sarar, D. & S.	. 156	Sitaphal, H 36	Tilphárá, D. & G.	37
Sarwar, H.	. 423	Soap-nut tree, E 115	Timal, H.	377
Sátián, H.	. 277	Sohjná, H 134	Timbúr, J.	72
Sat-muli, H	. 409	Solá, H 163		377
Satni, H.,	. 277	Solá plant, E 163	Timrú, J.	72
Satpura, G	. 332	Sonái, J 314	Tirboi, J.	
Satráwal, D	. 409	Sonátta, H 119	Tirmal, H.	377
Sedges, E	. 415	Sondná, H 134	Tirnoi, J.	233
Semal, H	. 58	Spear-grass, E. 424	Tithai, J.	80
Semla, H	. 170	Spruce, E 433		321
Sendroi, J	. 292	Sumálú, D 315	Titri, J.	126
Sephúr, H	. 343	Sun, H 139	Titroi, J.	
Sew, H.	. 197	Surál, D. & S 156	Tobacco, E	300
Shaddock, E	. 78	Súrú, J 343		300
Shángri, J	. 399	Sweet Flag, E, 414		85
Shanjoi, J	, 269	1	Tree-Rhododendron,	
Shaphroi, J	. 271	Taknoi, J 236		253
Sharánoi, J	. 409	Tákoj, J 189		322
Sharifá, H	. 36	Táli, P 160		322
Sharori, J	. 399	Tális, Tálisri, P. 254	Túmari, U. P.	
Sharphárá, J.	. 391	Tamarind tree, E 168	Túmri, D 328,	

AND VERNACULAR NAMES.

457

Tán, H.	. 85	Tút-ganthá, J. 425	, Walnut, E 392
Túng, J.	. 125	Tútri D	Wax-flower, E 205
Túngá, G.	. 125		Weeping Blue
Túnglá, H.	. 125	Unga. D 59	Juniper, E 428
Tungoi, J.	. 125	Otis, J 397	
Tunt, H.	. 364		Wig tree, E 125
Tunt, D.	. 365		Wild Date Palm, E. 412
Tuntri, D.	. 364	Vásiká, Sans 309	Willows, E 387
Turmeric plant, E.	. 405	Vilva, Sans 78	1
Túshiári, D.	. 383		Yew E 429
Túshiári, G	. 383	Walayti Kikar, H. 175	1
Tút, D.	. 365	Walayti Mehndi, H. 119	Zánú J 306
Tút, H.	. 364	Walayti Shisham, H. 167	Zardálu, H 186

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