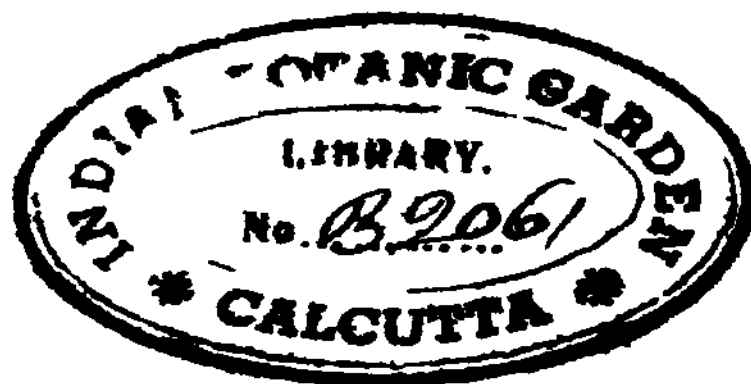


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BOTANICAL SURVEY OF INDIA

CLASS No. 580.4.....

BOOK No. PRA-6.....

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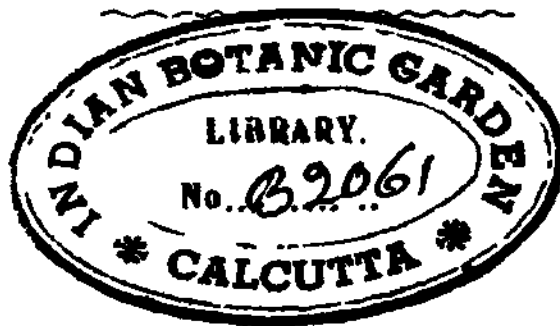
BOTANICAL

NOTES AND PAPERS.

BY

DAVID PRIN.

Reprints from Periodicals, 1894-1901,



•CALCUTTA%:

EMNTLD AI THE BAPHSI MISSION PRKSS,

1901.

NOTES
AND
PAPERS.



[Reprinted from the 'JOURNAL OF BOTANY' for May, 1905.]

AN ACCOUNT OF THE GENUS ARGEMONE.

BY D. PRAIN.

IN the course of a study of the *Papaveracea*, it has been found difficult to reduce the various forms of *Argemone* to systematic order. The genus does not appear at present to occupy the attention of horticulturists; it was, however, a favourite one in European gardens between 1827 and 1840, and as it is just possible that it may again come into fashion, an attempt at its arrangement may not be out of place. In the hope of appreciating the relationship of its various forms to each other, I have taken the opportunity afforded by a temporary residence in Europe to examine the material preserved in the herbaria of London, Paris, and Geneva. The present paper embodies the results of this examination, and is to be considered rather an account of the specimens of *Argemone* in the herbaria examined than a final review of the genus. This tentative revision is offered more in the hope that its perusal may induce American botanists, who alone are in a position to undertake the necessary field-study, to prepare the much-needed authoritative review that is called for, than in the belief that my conclusions are in every case justifiable. If, however, it is impossible to pronounce a final opinion on the systematic rank of any, save one (*A. fnticosa*), of the different forms here defined, it has been found possible, with the assistance of the European material, to assign authoritatively to all but one of them (*A. corymbosa*) their primary bibliographic references. As this portion of the paper may prove of use to students of the genus who cannot compare for themselves the specimens in the herbaria I have consulted, I offer this as an excuse for the preparation of a review that is incomplete as to matter and indefinite in result.

The principal herbaria consulted have been the herbaria of Kew (with the subsidiary *Herb. Carey*), of the British (Natural History) Museum, and of the Linnean Society (*Herb. Unmus*) in London; the herbarium of the Museum d'histoire naturelle (with its subsidiary *Herb. Turnefort*, *Herb. Lamarch*, *Herb. Jussieu*, and *Herb. Vurand*) in Paris; and the Public Herbarium of Geneva (including *Herb. Velesert*); for facilities and assistance in examining these I am deeply indebted to Mr. Dyer, Mr. Carruthers, M. Bureau, and M. J. Mueller. At the same time I have examined the material in the private herbaria of M. Casimir DeCandolle (including the *rodrommiTJerb.*) and of M. Barbey-Boissier at Geneva, as well as in the herbaria of M. Drake del Castillo (including *Herb. 1ZAU*) and of M. Cosson in Paris, all of which have been most kindly disposed to my disposal by their respective owners. For much help most ungrudgingly given during the study of this genus my very warm thanks are due to M. C. A. C. f. f. and M. C. A. C. f. f. * also * my friend M. Ad. Franchet

ARGEMONE TOURNEF.

Flores 8-meri, receptaculo anguste conico; sepala 3 conformia sub apicein cornuta et lateraliter parum alata, libera convoluta decidua; corolhe 2, petalis utriusque 3, conformibus convolutis vel imbricatis deciduis; stamina plane indcfinita hypogyna, filamentig filiformibus vel medio (rarius prorsns) parum dilatatis apice snbulatis, antbcris linearibus basifixis oxtorsum 2-rimosi post anthe&in curvatis; carpella definita 4 (rarissime 3)-G in germen ovatum vel cylindrico-ovatum vel subfusiformo coalita, placentis nerviformiōus oo-ovulatis, stylis brevibus vel brevissimis prorsus coalitis stigmata totidem ovata acuta discreta intus sinubusque stigmatosa cum placentis alternantia gerentibus; niatura aculeata (rarissime inermia) placentis stylisque persistentibus, valvis nunc triente summo nunc fere ad basin soluta; semina plurima globosa testa reticulata raphe parum sed distincte cristata.

Herbae ramosre seepe robust© annual, biennes vel raro forsan perennes (species singula frutex lignosus perennis) glaucescentcs; succus flavus; folia inciso-pinnatifida (cnicoidea) vel lobata (Ilicina) sfcpiissime caulibusque spinosa et aculoata vel rigide setosa raro hispida; flores terminales vel cymosi, albi, rarius flavi, rarissime rosei, alabastris erectis.

Species certiores 6, formre distinctae tamen saltern 11, omnos American©; forma singula tamen late per regiones tropicas subtropicasve orbis totius, altera stricte in insulis archipelaginis Hawaiensis inquilina.

The genus *Aryemone* as at present understood was defined by Tournefort, who included in it only one species, which he named, on the supposition that it was of Mexican origin, *A. mejicana*.^{*} This particular plant he appears, however, only to have known through European cultivated specimens; at all events, those in his herbarium are garden ones. It was first introduced to Europe in 1592, and was raised in London by Gerard, who sent seeds or examples to O. Bauhin. It was described by both authors, though Bauhin's description appeared a year before that of Gerard. Bauhin named it *Papaver spinosum*,[|] a^{*} name that indicates with considerable accuracy its natural position, and that possesses the advantage of conveying no misleading geographical significance; his English friend named it *Carduus chnjsanthus peruamis*,[|] an expression that merely translates the name "Golden Thistle of Peru," by which it was known to the earlier English voyagers to the West Indies, and under which it was brought to Gerard from the Antilles. It may be one of the several plants included by the Mexicans under the name *Chicalotl*,[%] for it certainly is included among those known to the Spanish Americans as *Cardo Santo* and *Vigo del Inferno*,^{||} two terms that cover, after a fashion, the Mexican

* Tournefort, *Elem.* 204 (1G&4).

f C. Bauhin, *Phytopinax*, 311 (1590).

{ Gerard, *Herbal*, 997 (1597).

§ Hernandez, *Ilistor.* 215 (1651).

|| For a quaint explanation of this term see Gerard's *Herbal*; this explanation will be found sometimes, but erroneously, attributed to Johnson, who edited a later edition of Gerard, by authors who have not consult^{TM!} HIP original work.

name. An examination of Hernandez's figure shows, however, that it is not *A. vuwicana* which he attempts to delineate; a study of Mexican specimens shows that, except from one or two places close to seaports on the eastern coast, where it is only an introduced, and probably a recently introduced, plant, *A. mexicana* does not occur in Mexico at all. At the same time Hernandez points out that the name *Chicalotl* includes white-flowered forms for which the Spanish American name at present is *Cardo bianco*, the other epithet being restricted to yellow-flowered ones. The common English name for the plant now, alike in the West and the East Indies, as well as throughout the United States, is the "Prickly Poppy" or the "Mexican Poppy"; these terms are, however, applied to most of the Argemones, and are not any longer restricted to *A. mexicana*.

In the light of the material of the natural order *Papaveraceae* reported during the seventeenth century, Tournefort was amply justified in separating Bauhin's *P. spinosum* from *Papaver*; as he was at the same time relegating to *Papaver* all the species known to earlier authors as *Argemone*, he did well to utilize this classical name in designating his newly defined genus. It must, however, be recollected that in so doing he altered completely the incidence of the name, and that the etymology of the word, which referred to a supposed efficiency of the juice of the classical *Argemone* in the treatment of cases of cataract, bears no relationship to any attribute, real or imputed, of the genus as now understood.

The original *Argemone* of classical and post-classical writers included apparently the plants known now as *Papaver Argemone* and *P. hybridum*, two species of *Papaver* § *PJiceades*. According to C. Bauhin, however, who may be quoted as one of the ablest taxonomists the science of Botany has ever known, this genus included two forms now referred to *Papaver* § *Scapijlora*, viz., *P. nudicaide (alpinum)* and *P. nudicaule (pyrenaicum)*.* To these four Morison added later another *Papaver* § *Bhaades*,—the plant now known as *P. dubium*.ⁱ All five owe their true localisation in *Papaver* to Tournefort, whose simple and natural arrangement was at Linnaeus's disposal when half a century later he issued the *Species Plantarum*. Linnaeus, however, was unable to accept either Bauhin's or Tournefort's conclusions; the two prickly-capsuled *Uvades*—the classical *Argemone*—he referred, with Tournefort, to *Papaver*; he did the same with Morison's *Argemone*—indeed it was only as an afterthought that he separated it specifically from *P. Uhocas*. So far all is clear; it is his further treatment that is disconcerting. Of the two § *Scapijlora* *Papavers*, which most authors now admit to be conspecific, he, following Tournefort, placed one in *Papaver*, and, following Bauhin, placed the other in *Argemone*. Linnaeus still further complicated matters by adding to *Argemone* a third species unknown to Bauhin or Morison, which was first discovered and described by Tournefort. J This plant—

* C. Bauhin, *Pinax*, 171, 172 (1623).

t Morison, *Hist. Univ.* i. 279, § iii. t. 14, f. 11 (1680).

{ Tournefort, *Corollan* 17 (1703).

Argemone armeniaca Linn.—is at present treated as the type of the very distinct § *Miltantha* of *Papaver*, quite as distinct from any of the other sections as half the proposed genera of *Papaveraceae* are from each other. When its subordination from utilitarian motives to one of the larger allied genera is decided upon, it becomes a very open question whether it ought to find a place in Tournefort's *Papaver* or in Viguiet's *Meconopsis*: its stigmas are arranged and its capsule dehisces exactly as in the latter genus; the only character that separates it from *Meconopsis* and justifies its association with *Papaver* is the absence of a distinct style. But though its characters go far to justify Linnaeus in removing this plant from *Papaver* they do not in any way support his location of it in *Argemone*. The result, however, of the treatment in the *Species Plantarum* is that the Linnean genus *Argemone* can only by courtesy be quoted as synonymous with that of Tournefort. Whereas the Tournefortian genus, by completely excluding the *Argemone* of Bauhin, and thus of necessity also the classical *Argemone*, remained as a result of Tournefort's definition and limitation the apparently natural genus that we still accept, the Linnean *Argemone* is a mere arbitrary conglomeration of *membra disjecta* without even possessing the excuse of attempting to conserve the classical incidence of the name. The only possible explanation of this treatment is that Linnaeus had not seen, when the *Species Plantarum* was issued, either his *A. pyrenaica* or his *A. armeniaca*, and it is interesting to find that he probably never saw them, for neither is represented in his own herbarium. In 1753 Haller published an *Argemone* which is evidently a *Papaver*, and is probably a form of *P. nudicaule* (*idpinum*).* But no other author has added a species to the genus in the Linnean sense, and the confusion introduced by Linnaeus did not long persist, for in 1784 Lamarck again restricted it within the Tournefortian limits;! with perhaps the single exception of Lestiboudois,† he has in this been followed by all subsequent authors of any importance.

The place usually assigned to the genus *Argemone* is alongside of *Meconopsis*, *Papaver*, and the allied genera that constitute the *Eupapaveraceae*. This is not an altogether convenient arrangement, because it places among genera in which the flowers are usually of 2-merous type one in which the floral arrangement is normally 3-merous. It is quite impossible, however, to find any character in this troublesome order that does not at times break down, and in the present instance the two most distinctive characters, a constant or almost constant 3-merousness and the presence of horns under the apex of the sepals, both fail us within the limits of the group of species that we are accustomed to treat as forming the genus *Papaver*. Not only is the presence of 3-merous flowers an occasional feature in wild examples of § *Scapiflora* (*P. nudicaule*), and in a species (*P. lateritium*) that forms a connecting link between § *Scapiflora* L. and § *Calomecon*, but it is a normal character in both

* Haller, *Plant. Goetting.* 89. † Lamarck, *Encyc. Meth.* i. 247.
 { Lestiboudois, *Bot. Belg.* iii. pt. 2, 132 (1799).

the varieties of *P. orientale* which is the type of this latter section; occasionally it occurs in cultivated, more rarely in wild, examples of several other species. Then the peculiarity of horned sepals is characteristic of *Papaver yacoinum*, which is otherwise very nearly related to *P. Argemone* and *P. hybridum*.

But the arrangement is moreover as unnatural as it is inconvenient, for the position in question is based on a misdescription of the stigmatic lobes. In place of having concrete stigmas, as in the Papavers and the majority at all events of the Meconopses, the lobes remain discrete, as they do in *Chelidonium* & *Stylophorum*. The lobes are moreover erect, and alternate with the placentas; the structures so often described as radiating stigmatic lobes opposite the placentas are nothing more than horizontal prolongations of the sinuses between the lobes. But even this distinction, which has been greatly used in most systematic arrangements of the *Papaveraceae*, is of little real importance, for we now find that it is necessary to include in *Meconopsis* forms that exhibit this very peculiarity. Taken as a whole, however, its generic characters ally *Arycmone* most closely with the genus *Uomneya*. This genus, supposed, when its name was employed by Mr. Benthain to designate the tribe *Uomneyea*, to be characterised by having discrete ripe carpels, is now found to have a fruit that is not distinguishable from the fruit of a *Meconopsis* or an *Arycmone*, and thus clearly connects *Platytiyma*—which, as Mr. Greene has shown, does not deserve to be recognised as generically distinct from *Platystemon*—with *Aryemone*. *Arctomecon* too, now that its structure is accurately known, cannot be generically separated from *Uomneya*, in spite of the intruded placentas of the latter, for the differences between *Uomneya Coulteri* and *Arctomecon californicum* are not greater than those between *Papaver somniferum* and *P. nudicaule*, not nearly so great as those between *Meconopsis robusta* and *M. Jlenrici*. And indeed the generic distinction between *Uomneya* and *Aryemone* is, on close examination, found to be of the slightest; there is only the partial separation of the tips of the styles in the first, and the presence of horns on the sepals of the last, left to differentiate them. We thus pass among the genera of trimerous type from *Plalystenwn*, where the ripe carpels are discrete, or nearly so, through *Ronmeya*, with its united ripe carpels, but partially

* This difference, at first sight considerable, is rendered insignificant by the occurrence of two Meconopses in China, one (*M. chelidonifolia*) with an ovate fruit and deeply intruded *Paixer-like* placentas, the other (*M. Olivenaim*) with a narrow cylindrical fruit and nerviform ones; these two species are in every other respect so alike as to be indistinguishable.

t A careful examination and analysis of *A. californicum* and *A. humile* leads me to fear that Mr. Coville's separation of these as species, though certainly convenient from the local point of view, cannot be sustained when the order is examined from the monographer's standpoint. This applies with even greater force to *A. M&rriami*, which, however, I only know from Mr. Coville's drawing and his excellent description. The polymorphism in this alpine species is by no means BO excessive as that displayed in the corresponding *Papaver* (*P. nudicaule*); even the tendency to 2-mery shown in *A. humile* is paralleled by the tendency to 3-mery shown in *P. nudicaule* proper.

discrete styles, to *Aryemone*, with styles as well as carpels fused, but with stigmatic lobes so discrete that their stigmatic surfaces are only continuous at the bases of the intervening sinuses. This being the case, no hesitation is felt in uniting to the same group the curious 3-merous genus *Canbya*, where there is HO longer any style, but where, as in *Papaver*, the merely marginal linear stigmas are, when mature, concreted into rays along the placental ribs, thus giving rise to the condition spoken of in *Papaver* and its allies, with sufficient accuracy from the taxonomist's, but quite erroneously, from the morphologist's point of view, as that of "stignias opposite the placentas.* For the whole of these 3-merous genera—all of them, it is to be noted, American—the name *Uomneyea* with a modified significance may still be conveniently employed. The rank of this group is probably no more than sub-tribal; along with the extremely natural 2-merous group *tlunnemannia*, characterised, like *Platystemon*, by valves that in dehiscing carry away the placentas on their margins,—also, like the *Uomneyea*, purely American, and, like them, probably only of subtribal rank,—the *Uomneyea* form a very natural "tribe," to which the name *Arç^tomecones* may not inappropriately be applied. This, however, is a question of academic rather than of practical interest, and cannot be pursued further or in greater detail in a sketch like the present.

The statement that the floral arrangement in *Aryemone* is not always 3-merous has found a place in most accounts of the genus. The authorities for the statement are Haller, who describes an *Aryemone jiore albo, sape 3-petalo* [PL Goett. 89 (1753)] with the purely imaginary character of the petals being equal in number to, and varying directly with the number of, the carpels; Sims [Bot. May. t. 23-12 (1822)], who figures *A. albijhra* with eight sepals and eight petals; and Groom [wi. Joim. Sc. ser. 1 (1831)], who says that *A. Georyiana* has sometimes four sepals and eight petals. Haller's plant is also Zinn's, but Zinn, as his definition shows, knew nothing about the genus, and, as his reference shows, knew nothing about Haller's plant; so far as it can be made out now, though the matter is of little moment, the plant was a *Papaver*, and not an *Aryemone* at all. Sims' figure is so accurate; the plant from which it was drawn has some, though all, of the flowers 4-merous. Groom's remark is justified, for it is at Paris a wild specimen of the species described by him in Florida, with some of the flowers 4-merous. But Sims' and Groom's plant are the same species, and are both of them *Ajess* boudois's *A. alba*; equally curiously, one of the oldest European cultivated specimen of this species, which once belonged to Jussieu, and is named *J. alba* Juss. in *Herb. Packard*, exhibits

* The true state of affairs in *Papaver* was stated in 1839 by Elk^{*} and demonstrated conclusively in 1857 by Payer; organically the *Papaver*, as in every other of the Papaveraceous genus, alternate with the placentas. t "Sepala 2-3 (rarius 4?). Petala 4-G (rarius 8?)."—Benthain & G. *Getxera Plantarum*. "Flores plerumque 3-neri."—Baillon, *UM. des i* "B1. zuweilen 3-zahlig."—L>rantl & Kundig, *Nat. PjJanzenfam*.

same peculiarity; there are no others at London, Paris, or Geneva. It is, however, a peculiarity apparently specific; not a single example at London, Paris, or Geneva of any other species has a flower with more or fewer than three sepals and six petals; there is certainly not at Kew or in the British Museum a specimen of *Argemone* with two sepals or four petals. The undue emphasis that has been laid on this variability, confined, as it seems to be, to a solitary form in which it but rarely occurs,—which most taxonomists have moreover insisted on treating as only a variety of *A. mexicana*,—can be best combated by omitting the character from the generic description; it is certainly not in the slightest degree characteristic of the genus.

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THE greatest difficulty in the treatment of the genus has been experienced in the limitation of its species. Thus in 1799 Lestiboudois distinguished as *A. alba* the white-flowered plant which Lamarck had separated in 1784 as a variety of *A. mexicana*; in 1812 Stokes distinguished as *A. sexualvis* those specimens of *A. mexicana* with six placentas. This last "species" is certainly not a defensible one, for the number of valves in the capsule varies from four to six on the same plant. The name, however, was legitimately applied, and is not a mere synonym, like Moench's *A. spinosa* (1781); Salisbury's *A. versicolor* (1789); and Spach's *A. vuhjaris* (1839)—three names indicating as many deliberate attempts to supplant the name used by Linneus and Tournefort. Lestiboudois's *A. alba* was described and renamed *A. albiflora* in 1815 by Hornemann, and figured under Hornemann's name by Sims in 1828. In 1817 Bafinesque described as *A. alba* a plant that is not the same as Lestiboudois's *A. alba*; in 1821, however, and again in 1824, DeCandolle reverted to the Lamarckian view, and included not only Hornemann's *A. albiflora* (Lestiboudois's *A. alba*), but Eafinosque's one as well, in his *A. mexicana*. In 1823 James distinguished still another *A. alba*, somewhat different both from that of Lestiboudois and that of Bafinesque. But alike in America and in Europe the recognition of a white-flowered species apart from *A. mexicana* was during the first quarter of the present century very half-hearted, and most botanists in both hemispheres have been content to recognise in it only a variety (*albiflora*) of the best known yellow-flowered species. It must not, however, be overlooked that the cleavage is hardly the same in the two continents; the *A. mexicana* var. *albiflora* of DeCandolle (1821) is practically Lamarck's plant, and, even if it be held to include Bafinesque's one, is equivalent to *A. alba* and *A. platyceras*; the *A. mexicana* var. *albiflora* of Torrey (1828), which is, in the main, that of subsequent American authors, is the quite different *A. intermedia*.

In 1827 Link and Otto described as *A. platyceras* the plant which, though they did not know it, is the *A. alba* of Bafinesque, and in the same year Sweet described the perhaps distinct *A. f/randiflora*; in 1828 Sweet separated from *A. mexicana* the yellow-flowered plant characteristic of Mexico, as opposed to that of the West Indies; this Mexican plant he named *A. ochroleuca*. In 1830 Sweet named, without describing it, *A. intermedia*, which, though Sweet did not know it, is the *A. alba* of James; in the same year Penny described as *A. Barclmjana* a plant that is only a form of *A. ochroleuca*. In 1831 Hooker described as *A. rosea* a plant from Chili that is perhaps only a variety of *A. platyceras*; what is certainly only another form of *A. rosea* was described in 1833 as *A. Ihinnemannii* by Otto and Dietrich. In 1834 Croom redescribed

as *A. Georgiana* Lestiboudois's *A. alba* (Hornemann's *A. albiflora*); and *A. Gray* described in 1845 as *A. hispida* a plant that is perhaps, as most American botanists think, not specifically separable from *A. platyceras*. In 1854 *A. fruticosa* of Thurber, the only ^{*V*TM1} whose validity it is impossible to dispute, was published. In 1854 Durand and Hilgard published as *A. munita* a plant that is certainly only *A. Impida* of Gray, and in 1886 Greene published as *A. conimposa* one that is perhaps only *A. intermedia* of Sweet. # besides the forms enumerated there are two others which are more or less distinct: one is from the Sandwich Islands; this I have in the present paper referred to *A. alba*, but, perhaps rightly, Mr. Huttall has proposed for it specific rank, under the name *A. Lauca*; another from Northern Mexico has been issued by Mr. Pringle as *A. platyceras*, an impossible identification; this latter I have referred, as a temporary measure, to *A. intermedia*; but it is perhaps deserving of specific rank, and, if so, may be conveniently known as *A. stenopetala*.

There are thus at least eleven Argemones which are easily distinguishable, and which admit of more or less satisfactory definition. And, as a study of their bibliography and a perusal of the notes appended to their systematic diagnoses will show, it is not improbable that even more forms may yet be satisfactorily differentiated. But these forms are not by any means all of equal rank; in place, therefore, of giving in every case a specific value to their characters, I have only allowed specific rank to each of the separate groups of forms, assigning to the different Argemones of each group a merely varietal position, and leaving it to ^{aut Jj°*s} who can make a careful study of the genus on the lines adopted by Mr. Greene in his study of the genus *Eschscholzia*, to assess at its true worth the claim of each individual form to separate recognition. In the three most important works in which the genus has been defined,* the number of species admitted has been five or six; this estimate is apparently based on the purely compilatory and uncritical revision of the genus by Walpers,t for in the only serious attempt that has been made to review the species of *Argemone* Otto and Dietrich\ have recognised eight. It is significant, too, that these last-named authors are the only botanists who have not given way to the tendency, against which Sir William Hooker § warned botanists to be careful, of relegating to *A. wexicana* any form that it is difficult to localise. When, therefore, it is pointed out that the number of species recognised in this paper is only six, and that thus it is in accordance with the estimates referred to, care must be taken not to conclude that the treatment here adopted is in any way intended to distort the genus as so as to

* Bentham & Hooker, *Genera Plantarum*, i. 52; Baillon, *Histoire des Plantes*, iii. 113; Prantl & Kiindig in Engler, 'Natürlichen Pflanzenfamilien', liu pt. 2, 141.

t Walpers, *Repertorium* i. 109 (1842).

t Otto & Dietrich, *Allgemeine Gartenzeitung*, i. 298 (1833).

§ *Bot. Miscell* ii. 207 (1831).

support that estimate; the "species" of this paper are in reality aggregations of forms that probably most botanists would recognise as specifically distinct. What canons are applied in limiting the species admitted in the *Genera Plantarum* or in the *Histoire des Plantes* we have no means of judging; it is, however, evident, from the citation there of *A. Hunnemannii* as distinct, that in the *Natürlichen Pflanzenfamilien* the limitation is less rigid than that employed here.

As regards the claim to recognition of *A. fruticosa*, dispute, as has been already said, is impossible. Its fruticose habit, its holly-like leaves, its capsules dehiscing nearly to the base, separate it unmistakably from all the others. In the rest we find the habit herbaceous, the leaves thistle-like, the capsules dehiscing only in the upper part. Indeed, it is a matter to be thankful for that generic rank has not as yet been claimed for *A. fruticosa*, seeing that the character afforded by its fruit is exactly that on which alone depends the separation of *Roemeria* from *Papaver* § *lilceades*, and of *Cathcartia* from *Meconopsis*.

When, however, we examine the remaining forms, considerable difficulty is experienced. The general characters derived * from habit and foliage are somewhat variable within each, and certain of the forms simulate others in a remarkable manner. Thus *A. stenopetala* repeats the habit and foliage usually present in *A. mexicana*, while *A. intermedia* in its southern form repeats those present in *A. ochroleuca*, and in its northern form (characteristic of the western prairies) those of *A. ylatyceras*. *A. alba* usually resembles *A. ochroleuca*, but sometimes imitates the northern form of *A. intermedia*, while *A. rosea* (the Chilian plant) imitates now *A. hispida* of the Eocky Mountains, and now *A. glauca* of the Sandwich Islands. If these general characters are to be relied on, there is nothing to be said against the view that would reduce the number of species of *Anjemone* to two, viz., *A. fruticosa* and a second composite and very variable species. If, indeed, the commonly received reduction of *A. alba* to *A. mexicana* be insisted on, this wider reduction becomes a logical necessity. When, however, the subject is more closely investigated, we find that the general similarity in this last instance is rarely very great, and is never so marked as in the case of some of the forms usually accepted as distinct; there is, moreover, always a characteristic difference in the disposition of the bracts, the shape of the sepals, the size, shape, and colour of the petals, and, above all, in the shape and consistence of the fruit. Indeed, beyond the fact that both are Argemones, there is nothing in favour of their reduction to one species. The same remark applies with equal force to the identification of *A. intermedia* with *A. ochroleuca*.

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THE difficulty occasioned by the union of these dissimilar forms has been got over by the statement that *A. mexicana* is highly variable. This statement is, however, purely hypothetical, and, as applied to the original *A. meodcana* of Tournefort and Linnaeus, quite incorrect. This is shown by an examination of the numerous specimens of the plant reported from various parts of the Old World where this form exists as an introduced plant, and where no other form of *Argemone* occurs. In India, for example, where the species extends from the Punjab and Kamaon to Ceylon, and from Malabar to Bengal, growing everywhere from sea-level to an elevation of 5000 ft. in the Himalayas and the Nilghiris, and flourishing equally well in the humid atmosphere of the Gangetic Delta and on the dry table-land of the Deccan, there is probably no species indigenous or introduced that accommodates itself so readily to altered conditions and yet remains so absolutely true to its essential characters as does *A. mexicana*. An examination of the specimens from Africa, where it occurs from the Gape to Algeria, from Socotra to Senegal, shows that in this continent also the same is absolutely true. Seeing that this is so, we are compelled, unless we are prepared to forego any attempt at classification whatsoever, to separate, once for all, the white-flowered Argemones from the yellow-flowered ones. But within the yellow-flowered group itself we find quite sufficient difficulty, for though the statement that *A. meodcana* is variable outside America is incorrect, we do find in the New World specimens with yellow flowers that seem at first to bear out the general contention as to the variability of *A. mexicana*. Here again, however, a more careful examination shows that the assumption is hypothetical, and is due not to any variability in the flowers or fruit of *A. mexicana*, but to a want of care in separating from it a quite distinct form as constant apparently in essential characters as itself. There is no doubt that what has been the cause of this misapprehension is the fact that this second plant is really a Mexican one, while that which bears the name *A. mexicana* is in Mexico only an introduced one, occurring occasionally on the eastern coast in the vicinity of seaport towns. Though the differentiation of these two is always easy, and though no intermediate forms are as yet reported, I have, following Lindley, treated them here as varieties of one species, which thus includes all the yellow-flowered forms except *A. fruticosa*; even if Sweet's differentiation of *A. ochroleuca* be ultimately sustained, there is no doubt that the two constitute a natural group of forms.

The question which next arises is whether the whole of the white-flowered forms can be treated as one species. If this were possible, we should then have but three species in the genus, viz., *A. fruticosa*, *A. mexicana*, and *A. alba*. But a closer examination of these white-flowered Argemones shows that this treatment is

impossible, and that it is necessary to recognise at least eight distinct white-flowered Argemones which arrange themselves in four definite groups, here treated as "species." The reasons for this treatment are indicated in the key which follows, and are more fully explained in the notes appended to each "species," where, at the cost of a certain amount of unavoidable repetition, the facts stated in the foregoing paragraphs are more fully detailed.

Medical qualities have been attributed to *Argemone* in America by the Mexicans, whose ideas have been accepted by the Spanish residents of Mexico and South America. Their common belief in its efficacy in the treatment of syphilis has passed, probably through the Portuguese, into Eastern Africa; it is noted by Taylor on specimens at Eew, from Mombasa, that the natives there make use of it in this ailment. The oil of *Argemone* is said by Dymock to be medicinal; this oil has been examined by Wittstein and Mueller. The Argemones begin to flower in Mexico in March; in the Eocky Mountains, Nevada, &c, not till September and October. The following have been introduced into Europe as garden plants, their showy flowers and their white-veined leaves rendering them acceptable:—*A. mexicana* (introd. 1592); *A. alba* (before 1783); *A. ochroleuca* (before 1790*; 1828); *A. grandiflora* (1827); *A. platyceras* (1827); *A. intermedia* (1880*; 1878*); *A. rosea* (*Hinne-mannii*) (1833*); *A. stenopetala* (1885*).f

The area in which the genus is indigenous includes Mexico, the West Indies, and the Western and South-eastern United States. In Mexico occur *A. grandiflora*, *A. mexicana* (*ochroleuca*), *A. platyceras*, *A. intermedia* (*vera* and *stenopetala*), and *A. fruticosa*. The first and last mentioned are confined to Mexico; *A. ochroleuca* extends, probably introduced, throughout the western and southern portions of S. America, and is naturalised in Australia; *A. platyceras* extends northward throughout California, Arizona, and Western Texas, and is represented in the Great Basin and the Eockies by *A. hispida* in Chili by *A. rosea*, the latter being probably an introduced form altered by its environment; *A. intermedia* extends through New Mexico and Texas to the western prairies. *A. mexicana* (*vera*) is indigenous in the West Indies, and has become naturalised in all tropical and subtropical countries, except the Pacific American coasts. *A. alba* (*vera*) is confined to the South-eastern United States, but in the Sandwich Islands occurs a form *A. glauca*, which is perhaps only an altered introduced condition of this species.

CLAVIS SPECIERUM VARIETATUMQUE ARGEMONES.

Fruticosa; foliis ilicinis; capsula fere ad basin
 usque soluta (petalis luteis) 1. A. FRUTICOSA.
 Herbaceae; foliis cnicoideis; capsula triente
 summo soluta:—

t The * indicates that the cultivation of the form was not continued after the date of introduction mentioned.

- Floribus luteis.** 2. A. MEXIOANA.
 [Stylo subnullo. Var. *typica* (=A. *mead-*
cana L.).
 Stylo distincto. Var. *ochroleuca* (= A.
ochroleuca Sweet).]
- Floribus albis:—**
Bracteis secus ramos florales dispositis:—
 Capsula valvis teneribus aculeata, se-
 palorum cornubus minoribus . . . 3. A. ALBA.
 [Foliis florib usque minoribus aculeis
 ascendenti-patentibus. Var. *typica*
 (= A. *alba* Lestib.)
 Foliis floribusque majoribus aculeis
 reflexo-patentibus. Var. *glauca*
 (=A. *glauca* Nutt.).]
 Capsula valvis crasse coriaceis vix ar-
 mata, sepalorum cornubus elongatis 4. A. GBANDIFLOBA.
- Bracteis sub flores aggregatis:—**
 Capsula valvis teneribus sparse aculeata,
 sepalorum cornubus extus lsevibus 5. A. INTERMEDIA.
 [Ramis floralibus elongatis, sepalorum
 cornubus pyramidalibus. Var. *ty-*
pica (= A. *intermedia* Sweet).
 Ramis floralibus perbrevibus, sepa-
 lorum cornubus teretiformibus.
 Var. *stenopetala* (= A. *timopetala*).']
 Capsula valvis crassis densissime acu-
 leatis, sepalorum cornubus extus
 aculeatis 6. A. PLATYCERAS.
- [Alabastris globosis:—
 Foliis cauleque aculeatissimis sed
 glabris, petalis apice truncatis.
 Var. *typica* (= A. *platyceras*
 L.&O.).
 Foliis cauleque hispidis, petalis
 apice rotundatis. Var. *hispida*
 (=A. *hispida* Gray).
 Alabastris oblongis. Var. *chilemis*
 (= A. *rosea* Hook.).]

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1. ABGEMONE FRUTICOSA Thurber. Glaberrima valde glauca; ramis patentibus lignosis undique foliosis inermibus; foliis crassis iliciuis oblongis sinuatis margine spiuosis; floribus inter bracteas 8-4 foliaceas versus apicem ramorum brevissimorum aggregatas terminalibus; sepalis sub apicem in cornu tereti valde spinosum productis, extus aculeis perpaucis parvulis munitis; petalis sulphureis obovatis apice subtruncatis basi cuneatis; capsulis sulcatis basi rotundatis apice angustatis, stylo brevissimo coronatis, vaivis 4-5 densius aculeatis, aculeis subqualibus basi magnopere tuberculato-dilatatis, vaivis fere ad basin usque debiscentibus, seminibus globosis minoribus vix punctulatis. *Argemone fruticosa* Thurber ex A. Gray in *Mem. Am. Ac. n.s. v. [Plant. Thurber.]* 306 (1854); Walp. *Ann.* iv. **170** (1857); Torrey, *Mex. Bound.* 31 (1858); Hemsl. *BioL Centr. Amer., Bot.* i. 26 (1879); S. Wats. *Proc. Am. Acad.* xviii. 318 (1882).

America: Mexico borealis; Coahuila, in jugo Sa. Peiia, *Thurber*, n. 844! Sn. Lorenzo de Laguna, *Palmer*, n. 21!

Suffrutex perennis 45-75 cm. ramis divergentibus dense lignosis demum foliorum cicatricibus squarrosis, junioribus albo-glauciscentibus nunquam aculeatis; foliis coriaceis nervo centrali subtus parce aculeatis ceterum glaberrimis, margine ilicino-spinosis 2*5-4

cm. longis; bracteis foliaceis 2-2*5 cm.; sepalis 2 era.; alabastris 1¹/₂ 25 cm. latis; floribus majusculis 7-8 cm. latis; capsulis 1-5-2 cm. longis; seminibus 2 mm. latis.

This very distinct species cannot possibly be confused with any of the others.

2. ARGEMONE MEXICANA Linn. Glaberrima glaucescens ramis ascerylentibus gracilibus cauleque undique foliosis aculeis ascendentipatentibus sparse armatis vel glabris; foliis herbaceis sinuato-pinnatifidis margine cnicoideo-spinosis, veinis albidis; floribus inter bracteas 2-3 foliaceas ad apicem ramorum floralium perbrevium (var. *typica*) vel plus minus elongatorum (var. *ochroleuca*) aggregatas singulis terminalibus; sepalis sub apicem in cornu teretiformi keve productis, extus aculeis paucis munitis; petalis flavis vel aurantiacis (var. *typica*) vel ochroleucis (var. *ochroleuca*) obovatis apice semicircularibus basi saepissime late cuneatis; capsulis late oblongis 4-6 valvis; stylo subnullo (var. *typica*) vel distincto (var. *ochroleuca*), valvis coriaceis sparse aculeis subaequalibus in lineas 3 instructis armatis vel raro inermibus, aculeis basi parum dilatatis; seminibus globosis distincte reticulatis.

Var? *typica*: stylo subnullo, stigmatum lobis suberectis, capsula basi apiceque rotundata, floribus aurantiacis vel luteis, ramis floralibus magnopere abbreviatis. *Argemone mexicana* [Tournef. *Elem.* 204, t. 121 (1694), et *hist. Eei Heib.* 239, t. 121 (1700); Merian. *Insect. Surinam*, t. 24 (1705); Boerhaave, *Ind. Alt.* i. 280 (1720); Sabbati, *Hort. Bom.* 4, t. 65 (1745).] Linn. *Sp. Pl.* i. 508 (1753), et *Syst. Nat.* ii. 1073 (1759); Mill. *Diet.* i. 35, t. 50 (1760); Lamk. *Encyc. Meth.* i. 247, et *///.* t. 452 (1784); Gaertn. *Fruct. i.* 287, t. 60 (1788); Vitm. *Summa Plant.* iii. 297 (1789); Aiton, *Hort. Kew.* ed. 1, ii. 255 (1789); Brez, *Flor. Insect.* 211 (1791); Curt. *Bot. Mag.* t. 243 (1794); Willd. *Sp. Pl.* ii. 1148 (1799); Lestib. *Bot. Behj.* ed. 2, iii. pt. 2, 131 (1799); Pers. *Synops.* ii. 62 (1807); Schultz, *Obs.* 97 (1809); Merr. *Handb. d. Pflanzenkund.* i. 244 (1809); Dum. de Cours. *Bot. Cultiv.* ed. 2, iv. 468 (1811); Alton, *Hort. Kew.* ed. 2, iii. 290 (1811); Stokes, *Bot. Mat. Med.* iii. 195 (1812); Vig. *Hist. Nat. Pav.* 49, f. 26, & f. 4 (1814); Lunan, *Hort. Jamaic.* ii. 312 (1814); Pursh, *Fl. N. Amer.* ii. 366 (1814); Hornem. *Hort. Hafn.* 489 (1815); Nutt. *Gen.* ii. 9 (1818); DO. *Syst. Veg.* ii. 86 (1821); Elliott, *Bot. Carol, d Georg.* ii. 13 (1824); Bpreng. *Syst.* ii. 604 (1825); Darlington, *Florid. Cestrk.* 57 (1826); St. Hil. *Flor. Bras.* ii. 118 (1829); Wall. *Cat.* 8126, sched. E. exclus. (1830); Roxb. *Flor. Ind.* ii. 571 (1832); Hook. *Journ. Bot.* i. 190, quoad Drummond n. 15 tantum (1834); Wight & Arn. *Prodr. i.* 18 (1834); Barton, *Flor. Cestrk.* 316 (1837); Blanco, *Flor. de Filip.* 454 (1837); Torrey & Gray, *Fl. N. Amer. i.* 61, vars. */?.* y. exclus. (1838); Wight, *III.* t. 11 (1840); Eaton & Wright, *N. Amer. Bot. JTM* (1840); Walp. *Rep.* i. 109 (1842); A. Gray, *Gen.* i. 112, t. 47 (1848); Seem. *Bot. Herald*, 23 (in parte), 67, 78, 863 (1852); bchmidt, *Flor. Cap. Verd. Is.* 261 (1852); Richard, *Flor. Cub.* ii. 28 (1853); Schlecht. in Heller, *Beis. Metric.* 417 (1853); Hook. f. & Thorns. *Flor. Ind.* i. 251 (1855); Miq. *Flor. Ind. Bat.* i. pt. 2, 92 (1859); Chapm. *Flor. S. Unit. St.* 21, plantâ albiflorâ exclus.

(1860); Klotzsch in Peters, *Ileis. Mosunnb.* 169 (1861); Benth. *Flor. Hong Kong*, 15 (1861); Griseb. *Flor. W. bid.* 13 (1864); Mart. *Flor. Bras.* xiii. 315 (1865); A. Gray, *Manual*, 59, plantis albifloris exclus. (1867), Oliv. *Flor. Trop. Afr.* i. 54 (1868); Hook. f. & Thorns. *Flor. Brit. Ind.* i. 117 (1872); Baker, *Flor. Maunt.* 5 (1877); Baillon, *Hist.* iii. 113 (1877); Hemsl. *Biol. Cent. Amer. Bot.* i. 27, in parte, plantis Mexicanis exclus. (1879); Bello, *Ann. Hoc. Esp. Hist. Nat.* x. 235 (1881); Bailey, *Queensland Flora*, 11 (1883); Vallot, *Flor. Senegal*, 69 (1883); Stahl, *Flor. Porto Rico*, ii. 33 (1884); Bailey, *Pois. PL Queensland*, t. 3 (1887); Britt. & Rusby, *Tram. N. Y. Acad. Sc.* vii. 7 (1887); Balf. f. *Bot. Socotr.* 3 (1888); Prantl & Kundig, *Engl. Nat. Pflanzenf.* iii. pt. 2, 141, hg. 83 B exclus. (1889). *A. spinosa* Moench. *Meth.* 227 (1784); Gater. *Plant. Montaub.* 99 (1789); Shecut, *Flor. Carol.* i. 202 (sphalmate *spinosis*) (1806). *A. versicolor* Salisb. *Prodr.* 376 (1796). *A. sex-valvis* Stokes, *Bot. Mat. Med.* iii. 195 (1812). *A. vulgaris* Spacfc, *Hut.* vii. 26 (1839). *A. meodcana* *. *lutea* O. Kuntze, *Bevts. l. l.*, var. *parviflora* inclus. (1891). *Argemone* Browne, *Hist.* 244 (1789). *Echtrus trivialis* Lour. *Flor. Coch. Chin.* i. 344 (17JÜ).

[*Papaver spinosum* C. Bauh. *PAyM*». 311.(1506); *Clus. Hist.* ii. 93 c. ic. (1601); C. Bauh. *Prodr.* 92 c. ic. (1620), et *Pinax.* 171 (1623); J. Bauh. *Hist.* 897 c. ic. (1651); Sloane, *Hut.* *^rnm.c.i.* 196 (1707). *Papaver spinosum flore luteo Papaven cornuto simUi*, *Imperat. Hi**. *Nat.* 873 c. ic. (1599). *Papaver spinosum Americanum* Parkins. *Theatr.* 366, 367 c. ic. (1640); Weinm. *PhytoL* iv. 40, t. 796d (1745). *Papaver campestre spinosum Chabr. Ic tibcwgr*, *Stirp.* 459 c. ic. (1677). *Papaver spinosum luteum foliis ventis* *albis notatis* Morison, *Hist. Univ.* i. 277, § 3, t. 14, f. 5 (1680). *Papaver spinosum flore luteo Barrel. Obs.* 47, t. 1141 (1714). *Cardttiw chrysanthenis peruanus* J. Gerard, *Herbal*, 993, c. 10. (101J/«J.

In insulis Indicis occidentalibus indigena; ad oras binus Aie» canani Oceanique Atlantici Americanas parcius, in Africa tota, Asiaqu^e austro-orientali late inquilina.

[*America*: Antilles majores; Cuba, *Ramon da Sagra* \ *Jamaica*, *Orisebach!* Hayti, *Jaeger I* Porto Rico, *Wjddler* n. 239! Antilles minores; *St. Thomas, Moller!* *Eggei-s I* Antigua, *Antonio I I indiey!* Martinique, *Hahnl* St. Lucia, *Anderson I* St. Vincent, *bnnntni* Bahamas, *Dale I* Florida; Key Is., *Herb. Shuttlewoith* (spp. normalia cum spp. " *leiocarpa* " commixta)! Frederick Co., *Nuttaliy»* *Ueib. Durand!* Louisiana; apud New Orleans, *Drummond* n. 10 J Mexico; ad Tampico, *Berlandier* n. 2! ad Vera Cruz, *Jurgensen i Violet d'Aoitstl Kerberl* Cordoba, "dans les rues," *Bourgeau n.* 2309! Yucatan, *Lindenl* Cozumel ins., *Gaumerl* Guatemala; att Duenas, *Salvin l* Costa Rica (locus exactus nee notatus), *Endres * N.Grenada; Panama, *Seemann!*; "in locis calidioribus," *Tnana* Venezuela; prope Tovar, *Fendlerl* ad Cumana, *Bonplandl* Guiana, Surinam, *Ic. Meriani l* Foche! *Hortmann!* Brazil; ad ripas *ly^o* Madeira, "Hetb. Paris" \ in prov. Piauhuy, frequens (spp. " «^m carpa ") *f Gardner I* Bahia, prope mare, *Glocker I* apud Rio Janeiro, *Gaudichaud* n. 1058! *Glaziou!* *Miers!* Uruguay; Monte Video; prope mare (spp. cum var. *ochrohuca* commixta), *St. Hilaire!*

ImulcR Atlantica: Bermudas, Moseley! Canaries, L. Monteiro Bourgeau n. 209! 678! Lowe \ Hohenacker! Perez! Cape Verde Islands, Hooker! "Herb. Drake" \ Savatier! Ascension, Loomis! St. Helena, Burchell!

Africa: Algeria australis, Defflers! Senegal, A dan son ! Perrottet! Leprieur 1 Dupuis! Sierra Leone, H. H. Johnston ! Scott FAliot I Dahomey, Burton! Yoruba, Millson (spp. "leiocarpa")! Caput Bonte-Spei, Sonnerat! MacOivan! Delagoa, J. Monteiro I Zanzibar, Spekel Hildebrandt! Boivin! Mombasa, Taylor! Socotra, Schwknfurth n. 2681 Balfiir I Egypt, Wiest 1

Insula Mascarnes: Madagascar, Baron! Eodriguez, Balfour! Seychelles, Wright I Bourbon, Richard I Comoro; Mayotte, Boivin \ Mauritius, Commerson in Herb. Lamarck et Herb. Jussieu! Boivin!

Asia: India ubique; Himalaya Occident., Royle \ Strachey S Winterbottom! Nepal, Wallich! Panjab, Jacquemont n. 1527! Flan. Ganget. Sup., Edgeworth! Thomson! Bengal, Roxburgh! Hamilton! Wallich! Hooker I Clarke I Gwalior, Maries I Tranquebar, "Fratres Missionis" \ Bellary, Beddomel Nilghiri Mts., Wight b Madras, G. Thomson! Ceylon, Sonnerat! Malaya; Penang, Ic. in Herb. Kew! Java, Forbes! Sumbawa, Zollinger n. 3337! China; Hong-Kong, Wright I Lamont! Hance \ Krone \ Furet!

Australia: Queensland, Scortechini in Herb. Calcutt.!

Var. *ochroleuca* Lindl.: stylo distincto, stigmatum lobis divergentibus, capsula utrinque plus minus attenuata, floribus ochroleucis, ramis floralibus plus minus elongatis. *Argemone mexicana* var. *ochroleuca* Lindl. Bot. Reg. t. 1343 (1830). *A. ochroleuca* Sweet, Brit. Flow. Gard. iii. t. 242 (1828); Walp. Rep. i. 110 (1842); Loud. Hort. Bnt. ed. 2, Suppl. 472 (1850); Hemsl. Biol. Cent. Amer. Bot. i. 27 (1879). *A. sulphurea* Sweet ex Loud. Hort. Bnt. 216 (1830). *A. Barclayana* Penny MSS. in Hort. Eps. ined. ex Loud. Gard. Mag. vi. 115 (1830). *A. mexicana* var. ? Torrey & Gray, Flor. N. Amer. i. 61 (1838); C. Gay, Flor. Chilen. i. 100 (1845). *A. mexicana* var., S. Wats. Proc. Amer. Acad. xxiv. 88 (1889). *Argemone mexicana* Hook. Bot. Misc. ii. 208 (1831); Voy. Sulph. 64 (1844); Engelm. Wisliz. Rep. 112 in parte (1848); Seem. Bot. Herald, 268 (1852); Coult. Contrib. U. S. Nat. Herb. i. 65 (1890), et ii. 12 in parte (1891); Morong, Bull. Torrey Bot. Cl. xviii. 48 (1891), vix Linn.

[Chicalot! Hernand. Hist 215. plantà floribus candicantibus exclus. (1651).]

... *ⁿ "M^{-ex:co} " -fexasque indigena, in America australi praesertim in aitionibus versus Oceanum Pacificum spectantibus late, nee non in Australia sparse, inquilina.

[Amenca: Mexico boreali-occidentalis et California inferiore (spp. *parviflora* = *A. Barclayana*), Guaymas, Palmer n. 105! La r*M_r Palmer n. 55! (sine loco exacto), Exped. Sulphur* \ Texas occidentals Mexicoque (spp. floribus majusculis = *A. ochroleuca* vera). Texas; San Antonio, Herb. Paris I Mexico borealis; Monterey, Herb. Carey (Coulter n. 662)! Chilhuahua, Pringle & 257 (sub nom. *A. mexicana* distrib.)! Parral, Schumann

n. 2721 Mexico australis; prope Mexico, *Bourgeau* n. 6! in monte olim ignivomitante Batea, *GuiUemin-Terraye* 1 Plalpuquahua, *Graham* n. 1830! Orizaba, *Broteri* n. 786! *Meissnerl* Oaxaca, prope Pintepo, *Galeotti* n. 4744! America australis (spp. omnia *grandijiora*): Ecuador; apud Sacha, *Grisou!*, prope Latacunga, *llemyl Ja meson* n. 672 ! Peru; prope Callao, *Barclay I Gaudichaudl* n. 143!, apud Lanya, *Barclay!* Bolivia; prope Sorata, *Mandon* n. 889! *Mig. Bangl*, apud Catanga, *Pentland* 1 Yunga, *JJ'Orbignyl* Chili; ad Cobija, *Gaudichaid* in *Herb. Delessertl* Coquimbo, *Bridges!* Valparaiso, *Nuttalll* Quilotta, *C. Gay* (spp. cum *A. platyceras* var. *chinensis* commixta)! Paraguay; in urbe Corrientes et in aliis locis sed semper in vicinitate hortorum missionum, *Bonplandl* Uruguay; Monte Video, prope mare (spp. cum *A. mexicana* vera commixta), *St. Hilaire* n. 2416!, prope littora, *Courbon* n. 539 ! Argentina; in urbe Cordoba, *Hieronymus* n. 199 ! Pampas, frequens, *Gillies!*

Australia: in urbe Sydney, "George Street," etiam in collibus "Surrey Hills," nuncupatis, *Verreaux* n. 227 in *Herb. Parisi]*

Herbacea gracilis vel srepus robusta 45-90 cm. alta, ramis fastigiatis vel patentibus, foliis 8-20 cm. longis, 2-5-7*5 cm, latis; bracteis sub flores 3 cm. longis, 1-1-5 cm. latis; sepalis 2 cm. longis, cornu 6-8 mm. longo, apice spinoso, alabastris 1-5 cm. latis; floribus var. *typiece* 3-6, var. *ochroleiucce* 3-7*5 cm. latis; capsulis 4-5 cm. longis, 2 cm. latis; seminibus 2*5 mm. latis.

Various attempts have been made to change the name of *Argemone mexicana*; *A. spinosa* Moench. was proposed with the idea of conserving the oldest specific epithet, that of Bauhin; *A. versicolor* Salisb. was proposed out of a mere desire to alter the current name; *A. vulgaris* Spach was proposed in the hope of preventing the confusion that had resulted from the inclusion of one or more white-flowered forms in the original species. All three must be definitely rejected.

Several attempts have also been made to subdivide the true *Argemone mexicana*. *A. sex va I vis* Stokes is an attempt to separate as a species the forms with six placentas; this is impossible, because one finds capsules with four, five, and six valves on the same plant. The separation as var. & by Torrey and Gray of the form in which the capsules are devoid of prickles has much to be said in its favour; if we could definitely separate *A. ochroleuca* Sweet, as a species apart, it would be very convenient to treat this smooth-capsuled plant as a variety, to be named *A. mexicana* var. *leiocarpa*; it is only from a desire to prevent confusion that it has not been separated in the text. The distribution of this form "*leiocarpa*" is peculiar; it occurs in West Africa in the Yoruba country, but, as it happens to be the form reported by Gardner as "cornuion" in the province of Piauhuy, in Brazil, its presence in Africa may easily be explained by the intercourse which in slave-dealing times existed between Brazil and West Africa. And as the true *A. mexicana* is (in spite of the silence of books on the subject) rare in Brazil, being confined to river-banks and to the vicinity of several of the principal seaports, circumstances pointing manifestly to an

exotic origin, we might have supposed that this peculiar form was the Brazilian representative of the true plant of the Antilles. But the fact that the form occurs in Key Island (which is its *locus classicus*), close to the coast of Florida, and that it there grows alongside of the typical plant, renders such an explanation unsatisfactory. The last attempt to subdivide the plant has been from the size of its flowers. This was first done by Bourgeau in his *Planted Canarienses exsicc.*; the true plant was issued by him as *A. mexicana*, the large-flowered form as *A. mexicana* var. *ochroleuca*. But his large-flowered form (which, by the way, is the only one reported from St. Helena) is *not* the same as *A. ochroleuca* Sweet; it has exactly the fruit of the typical plants in the herbaria of Tournefort, Linnaeus, and Lamarck. The same subdivision has again been proposed by Dr. Otto Kuntze, who breaks up *A. mexicana* into two subspecies, a. *lutea* and !?. *albijora*, further separating from subsp. *lutea* a var. *parviflora*. It is not clear from this citation, though it seems probable, that O. Kuntze's "*lutea*" is a *mélange* of all the yellow-flowered forms of *Argemone*; it is, however, plain that he has misunderstood their synonymy, since an examination ^ of Tournefort's and Linnaeus's specimens shows that the true *A. mexicana* is Kuntze's *A. mexicana* a. *lutea* var. *parviflora*. The subdivision is, however, impossible; any one who cares to look for them may find both forms in the same patch, sometimes on the same plant, of *A. mexicana* as it grows in India.

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The differentiation of *A. mexicana* and *A. ochroleuca* is another matter. It is not always easy in dried specimens to separate them when the specimens are only in flower; when, however, we have fruits, it is impossible to mistake the two. Had the plants been European, instead of American, there is no doubt that *A. ochroleuca* would have received without question the rank of a species; it is, to take a familiar example, as different from *A. mexicana* as *Papaver duhium* is from *P. Rhceas*, and though we all know how, on occasions, every single differential character may break down in the case of these two allied "Poppies," few of us would venture to propose their formal union. Sir William Hooker has sounded a note of warning against the tendency, as strong apparently in 1831 as it is to-day, of uniting too readily the different forms of *Argemone*, and the only authors who have attempted to give a comprehensive account of the genus (Otto and Dietrich in *Allyem. Gartenzeit.* i.; 1833) have kept them apart. In deference, however, to the view of Mr. Lindley, I have here treated Sweet's "*ochroleuca*" as only a variety of *A. mexicana*; the duty of pronouncing a final verdict must be left to the botanists of America, who alone have the opportunities of making the study in the field that is necessary to decide the point.

The attempt made in the case of *A. mexicana* proper to separate a small-flowered and a large-flowered form might also be made within *A. ochroleuca*, the small-flowered form of which has been named *A. Barclayana*. The original description of *A. Barclayana* is unfortunately very inadequate, and Penny, its author, does not seem to have preserved specimens; at all events, none of his are to be found in the herbaria at Kew or the British Museum. But a plant known as *A. Barclayana* continued to be grown for some years after the date of publication of this form in English gardens; fortunately one of these is preserved at Kew, and it shows us that the plant so designated was that small-flowered form of *A. ochroleuca* which grows in Lower California, and on the opposite shores of the Gulf of California, in North-west Mexico. In this case again, were it possible to treat *A. ochroleuca* as a distinct species, we should be quite justified in treating this plant as a distinct variety, to be named *A. ochroleuca* var. *Barclayana*. As before, I have refrained from defining the variety in the text, so as to avoid the confusion that must result from the presentation of too many diagnoses.

Argemone mexicana was introduced to Europe in 1592, and

was first raised by Gerard, who sent specimens to his friend C. Bauhin; this explains why Bauhin's name happened to appear before Gerard's. It is rather unfortunate that Bauhin's specific epithet was not taken up by Tournefort or by Linnaeus, because the one by which it is known is somewhat of a misnomer. The plant came to Gerard from the Antilles, not from Mexico; except as a plant, almost certainly introduced, from the vicinity of one or two¹ of the Eastern Mexican seaports, the species is unknown from Mexico in European herbaria. The same is true of the Southern United States; the only specimens in the herbaria I have consulted that profess to be wild are one from New Orleans, at Kew; one from Frederick County, Virginia, in Herb. Durand—the latter was originally in Nuttall's herbarium; and those from Key Island. Pursh says that it extends as far north as S. Carolina, but admits that it is confined to river-banks. Gardiner and Brace would even insist on its being only an introduction in the Bahamas, and there can be no question as to its being exotic in the Bermudas. The other North American specimens that I have examined are some from Ohio, collected by Lesquereux, and marked "échappe des jardins," and o&e from Larepe, Wisconsin, glued down with a specimen of the prairie form of *A. intermedia*, evidently both garden specimens; both of them were issued from Herb. Hale as *A. mexicana*. I have therefore refrained from quoting either gathering in the text. It is stated by Wheeler also to occur as an escape near Milwaukee; I have not seen his specimens. As regards the peninsula of Yucatan and Central America, it is not so clear that the species is introduced, though there is equally an absence of definite evidence that it is indigenous. As regards the southern shores of the Caribbean Sea, the evidence from the specimens I have examined is also doubtful, because there are at Paris specimens collected in New Granada by Tnana, marked "région chaud jusqu'à l'hauteur 1000 mètres."¹ All the others are, however, from the vicinity of seaport towns. It is moreover strange that there are no specimens from any of the Leeward Islands, and if it occurs in British Guiana or Trinidad, no English botanist has yet sent it to Kew or the British Museum, while if it occurs in Cayenne, no French botanist has yet sent it to Paris. Its rarity in Brazil has already been commented on. There is no apparent reason why the species should not occur in the centre of Mexico, seeing that it has in India spread from Ceylon to Bengal and the Panjab, and occurs everywhere from sea-level to a height of 5000 ft. in the Nilghiris and the Himalayas. But, except for specimens collected by Bourgeau in the streets of Cordoba, we have nothing but *A. ochroleuca* from Central Mexico. There is equally no reason why it should not have extended along the Pacific coasts of America, as well as along the Atlantic seaboard. The fact, however, remains that the only specimens of *A. mexicana* from the Pacific seaboard in London, Paris, or Geneva are those collected by oemann at Panama; the presence of the species there is discounted by the extreme narrowness of the American Continent at that Point, and the fact that this is the place at which the isthmus is usually crossed. The epithet *periamis* applied by Gerard is thus

even more erroneous than that applied to the species by Tournefort and Linnaeus; numerous as the specimens of yellow-flowered *Argemone* from Ecuador, Peru, and Chili are, they all prove to be only *A. ochroleuca*.

When we turn to the Eastern Hemisphere, we are at once struck by the fact that the species has spread much more extensively there than in America. In this it only exemplifies a rule, for which no satisfactory explanation has yet been offered, that weeds of the New World spread more rapidly in the Old, and *vice versa*.* Thus it is present in all the Atlantic islands, occurs throughout the whole African seaboard from Senegal to Socotra; appears in all the islands spoken of as Mascarene; and is widely diffused throughout South-eastern Asia.

The early figures of the species are of unequal value, but it is worth noting that all of them unmistakably indicate the true *A. mexicana* of the Antilles, except the plate in Hernandez, which, though a very poor one, represents a plant with the habit of *A. ochroleuca*, and not of *A. mexicana*. J. Bauhin's figure is good and unmistakable; Miller's is not so good; Lamarck's is excellent, and represents exactly the plant as represented in Tournefort's, Le Vaillant's, Cliffords, Linnseus's, and his own herbaria. It is interesting to find from Lamarck's herbarium that the specimen figured did not come from America, but from the Isle de France, where it was collected by Gommerson! Curtis's figure in the *Bot. Mag.* is excellent also.

It is curious to note that while the distribution of *A. mexicana* has been zonal, that of *A. ochroleuca* has been meridional. Instead of spreading eastward to Africa and Asia, like the typical plant, *A. ochroleuca* has spread southward along the countries that border the Pacific from Ecuador to Chili, spreading eastward, however, through Bolivia and Argentina to Paraguay and Uruguay. Thus at Monte Video, on the seashore the two forms have been found growing together; this is the only locality from which both have been reported; here *A. mexicana*, extending southward along the Brazilian seaboard, has come into touch with *A. ochroleuca*, spreading eastward across the Pampas. That *A. ochroleuca* is no more than an escape from gardens to the east of the Andes is pretty clearly indicated by the notes attached to the Argentine specimens of Hieronymus n. 199, and by the remark, "sponte crescit, Paraguay, et in omnibus vie. missionarum," attached by Bonpland to the specimens collected by him in Corrientes. It is not improbable that we have in this remark a clue to the manner in which it has been spread throughout South America, and that it was introduced from Mexico into Ecuador, Peru, and Chili by Spanish missionary priests.

* The extraordinary diffusion in Tropical Asia! of the American species *Tridax procumhens*, *Mimosa pudica*, *Ageratum conyzoides*, and especially *Scoparia dulcis* may be selected from among several scores of instances as striking examples of this phenomenon; on the other hand, the diffusion, in the proportions of a plague, of certain European species, not particularly unmanageable in their native country, in the Pampas of S. America, illustrates well the same rule.

It is generally supposed that this plant was not introduced to Europe till raised by Mr. E. Barclay at Bury Hill in 1828, when it was first described by Sweet. This is, however, a mistake, for there is a specimen in the herbarium of A. L. Jussieu which shows that it was already in cultivation at Paris in the eighteenth century. Its culture did not, however, at that time spread, and it is only since 1828 that it has become generally known.

In the synonymy under *A. mexicana* I have omitted all references by Australian writers,* except those of Mr. Bailey, whose figure¹ in *Poison. PL of Queensland*, as well as specimens in Herb. Calcutta collected by Scortechini, show that *A. mexicana* has at length really found its way into Queensland. It is, however, something of a reproach to Australian botanists that they have never yet sent to Kew or the British Museum any specimens of *Argemone* from Australia: the only ones from this continent, except the Calcutta ones that I have seen, are some in Herb. Paris, collected in 1845 by M. Verreaux in N. 8. Wales; it is interesting to find that the plant which he found, at that date, already established in Australia is not *A. mexicana* at all, but the Chilian form of *A. odirolenca!*

That our national herbaria should have been thus neglected need be no matter for surprise; it is always the case that plants which have become stigmatised as "common" are those of which the material when one comes to examine it is at once too voluminous and too inadequate. At Kew, the British Museum, and at Paris, there are ten times as many specimens of *Argemone mexicana* as are necessary for the morphological study of the species, but not nearly enough for the study of its distribution. Thus neither Kew nor the British Museum has a specimen from Australia, Ceylon, or the Cape of Good Hope; as regards Ceylon, the only examples I have seen are at Paris, and were collected by Sonnerat!; as regards the Cape, there are only two in Paris, one in the National Herbarium, again collected by Sonnerat! and one in Herb. Cosson, collected by Prof. MacOwan. On the other hand, the French botanists have never sent to Paris a specimen from Cochin-China; its presence there⁶ is therefore entirely on Loureiro's assertion; and, although it is clear from a remark made by Sir William Hooker that he has seen a Philippine specimen, there is no specimen from that locality either in London or in Paris now, and our knowledge of its existence there, except for Sir William's reference, depends entirely on its citation by Blanco. It would be well if collectors always kept in mind the fact that "the field" is not the place wherein to decide that a species is, or is not, common; it is their duty to collect and to communicate examples of *everything* they see; the responsibility of deciding whether particular specimens are or are not required must be left to those who alone are in a position to exercise it—the various directors or owners of great national and Private herbaria.

* It is said by K. Wood that *Argemone mexicana* is duller to be present as an escape in S. Australia, and by Censu. *Victoria plants*. ⁶ escape near Sydney. ⁶ it is not given in Baron von MueUer's B

8. ARGEMONE ALBA Lestib. Glabra glaucescens, ramis ascendenti-
bus gracilibus undique densius foliosis cauleque inermibus vel aculeis
pateitibus armatis, foliis herbaceis margine sinuatis cnicoideo-
spinosis, venis albidis; floribus supra bracteas 1-3 secus ramos
plus minus elongatos dispositas singulis vel rarius 2 terminalibus;
sepalis sub apicem in cornu brevissimum conicum herbaceum pro-
ductis extus glabris vel aculeis parvis perpaucis obsitis; petalis
albis oblongis basi angustatis apice truncatis; capsulis fusiforniibus
4-valvis, stylo distincto, valvis tenuioribus reticulatis aculeis sub-
requalibus basi vix dilatatis obsitis; seminibus globosis distincte
reticulatis.

Var. *typica*; foliis floribusque minoribus aculeis ascendenti-
patentibus. *Argemone alba* [Jussieu MSS.] Lestib. *Bot. Belg.*
ed. 2, iii. pt. 2, 182 (1799). *A. alHftora* Hornem. *Hort. Hafn.* 489
(1815); Sims, *Bot. Mag.* t. 2342 (1822); Otto & Dietr. *Allgem.*
Gartenzeit. i. 300 (1833). *A. Georgiana* Croom, *Am. Journ. Sc.*
Ser. 1, xxv. 75 (1834). *Argemone* sp.nov., Nuttall, *Gen.* ii. 9
(1818); Elliott, *Bot. Car. Georg.* ii. 13 (1820). *A. mexicana* var.
albijora DC. *Syst. Veg.* ii. 86, syn. *A. alba* Raf. et syn. Haller et
Zinn. exclus. (1821); *Prodr.* i. 120(1824); Lindl. *Bot. Beg.* sub
t. 1343 (1830). *A. mexicana* var. *a.* Larnk. *Encyc. Meth.* i. 247
(1783); *Syn. PL Mils. Fl.* (1806); De Freyl. *Cat. Jard. Butt.*
(1810); *Cat. PL Hort. Patav.* (1812); Vig. *Hist. Nat. Pav.* 50
(1814); Walp. *Rep.* i. 109 (1842). *A. mexicana* var.; Pursh, *Flor.*
N. Amer. 368 (1814). *A. mexicana* var. *y.* Torr. & Gray, *Flor. N.*
Amer. i. 61 (1838). *A. mexicana* Hook. *Journ. Bot.* i. 190, quoad
spp. apud Covington lecta (1834); Oliapm. *Fl. S. Unit. St.* 21,
quoad plantam albifloram [*A. mexicana* var. *alba* Chapm. MSS.
in Herb. Durand!] (1860) haudquaquam Linn. *A. vulgaris* var.
albiflora Spach, *Hist.* vii. 86 (1839).

America: Florida, Nuttall! Chapman 1 Georgia, *Herb. Paris* 1
S. Carolina, "M. A. 6." in *Herb. Drake* 1 Louisiana vel Alabama,
apud Covington, Dnimmond 1 Texas, apud San Felipe, Drummond 1

Var. *glauca*: foliis floribusque inagnis, aculeis reflexis. *Arge-*
mone rosea Hook. *Bot. Misc.* ii. 207, quoad spp. Sandvicensia (1830).
A. mexicana var., Sincl. *Fl. Hawaii*, t. 17 (1885). *A. mexicana*
Seem. *Bot. Her.* 23, in parte (1852); Hillebr. *Flor. Hawaii*, 7
(1888), haudquaquam Linn. [*A. glauca* Nuttall MSS. in Herb.
Brit. Museum. *A. lactuceifolia* Planch. MSS. in Herb. Kew.]

Polynesia: Ins. Sandvicenses; O&hn, Nuttall \ Menzies et Nelson!
G. Barclay! Remy I Dna. Sinclair \ Maui, Macrae 1 Ballieu !

Herbacea gracilis 30-90 cm. altis ramis floriferis gracilibus
4-10 cm. longis; foliis in var. *typica* 4-8 cm. longis, 1-5-2-5 cm.
latis; in var. *glauca* 10-25 cm. longis, 6-12 cm. latis; sepalis
2-2-5 cm. longis, cornubus 3 mm. longis, alabastris 1*5 cm. latis;
floribus 6-8 cm. latis; capsulis 2-5-3-5 cm. longis, 2 cm. latis,
stylo 4-6 mm. longo; seminibus 2*5 mm. latis.

The plant here described as typical *A. alba* was first differenti-
ated by Lamarck, who described it as a variety of *A. mexicana*. It
differs, however, so greatly in the shape as well as in the colour of
the petals, in the shape and size of the horns of the sepals, and in

the fruit, that there is no doubt that Lestibondois and Hornemann were amply justified in giving it specific rank. The difficulty does not lie in distinguishing it from *A. meAcana*^ but, as will presently appear, from the other white-flowered Argemones. Its nearest ally is the white-flowered *Argemone* of the Sandwich Islands which Sir William Hooker associated with the white-flowered *Argemone* of Chili, but which, owing to its agreement with the plant characteristic of the South-eastern United States in the disposition of its bracts, the shape and size of its sepals, the shape of its petals, and the armature of its capsule—all these being points wherein it differs from the Chilian form—I have ventured, in spite of its larger size, to treat here as a variety of *A. alba*. The species is also very nearly related to *A. grandiflora*, which, however, differs in having pedicels in the axils of all its floral bracts, so that its cymes become subpaniculate; in having long sepal-horns, and in having an almost smooth fruit with thick coriaceous valves. *A. grandiflora* is therefore, at least for the present, probably better left as a species.

The name *A. alba*, though, as Lestiboudois published it, merely a name, cannot be allowed to lapse, because at the time that Lestiboudois wrote this was the only white-flowered *Argemone* known in Europe—the next two to appear being *A. platyceras*, raised in Berlin, and *A. grandiflora*, raised in London, both in the same year (1827); the presumption therefore is altogether in favour of this being the plant intended. This presumption has been, however, as nearly as possible converted into a certainty by the discovery in Mr. Drake del Castillo's herbarium of a specimen of the plant that in Lamarck's herbarium forms the type of *A. mexicana* var. «.; cultivated, like Lamarck's type, in the Royal Gardens at Paris, but which had found its way from the herbarium of A. L. de Jussieu into the Herb. Eichard. This Jussieuan specimen is marked *A. alba* Juss.; Jussieu seems therefore to have been the botanist who first gave specific rank to the form, and it is highly probable that it is only Jussieu's name, not an original one, that Lestiboudois cites. As, however, Jussieu does not seem to have published the name, Lestiboudois must be quoted as the authority for it. It is strange that there is no duplicate of the specimen in Jussieu's own herbarium in Herb. Paris, particularly when we find, what was not to be expected, that it contains a specimen of *A. ochroleuca*, cultivated at that early date, in the Paris gardens.

The synonym *A. alba* Eaf. cited by DeCaudolle must be excluded from this form, for although Eafinesque described it in his *Flora Ludquiciana*, he states that his plant is a native of Mexico, only cultivated in gardens in Louisiana, and, as *A. alba typica* does not occur in Mexico, Eafinesque's plant is not the same as Lestiboudois's. must the synonym *Argemone flore albo, scpe 3-petalo* Haller, *PL boett.* 89 (1753); Zinn. *PL Guett.* 116 (1757). Haller's description suggests a *Papaver*, and Zinn actually supposes that it may have been *Argemone armenaiaca*, which is a *Papaver*. The colour of the flowers is against its having been this particular species, but it is not improbable that it may have been a white-flowered form of

Papaver alpinum, one particular form of which was named by Linnaeus *Argemone pyrenaica*. What the plant was, however, is of little consequence in this enquiry, and as Zinn, working only four years later in Haller's own garden, was unaware what the plant was, we can hardly hope ever to ascertain. We know enough, however, to justify us in refusing to accept the citation here.

The presence of a variety of this species in Polynesia, if var. *glauca* be really, as I think, best referred here, is difficult to explain. It is hardly likely that the form is truly indigenous in the Sandwich Islands, and yet it is difficult to see why the plant characteristic of the South-eastern United States should be that which has become established in this particular archipelago. One would rather have expected to find that the species present was characteristic of the Pacific coasts of America; indeed, Sir William Hooker has identified it with the white-flowered *Argemone* of Chili. If this be really the case, and it must be admitted that in habit and general appearance it much resembles the Chilian plant—hardly more, however, than it does the plant characteristic of the North American prairie³--it is remarkable that it should have assumed a form which, while remaining true to itself in all the specimens I have seen/should have diverged from the other Western American forms in the disposition of its bracts and in the shape of its sepals, and should in these respects have assumed the features which characterise the *A. alba* of the Eastern States. It is to be feared that we see in this combination of characters an indication of the necessity for refusing separate specific rank to any of the white-flowered Argemones, and of recognising in the genus only three species—*A. fruticosa*, *A. mexicana*, and a very variable *A. alba*.

The Sandwich Island variety does not appear to have ever been introduced into European gardens. The date of introduction of the true *A. alba* is somewhat uncertain. Hornemann states that it was introduced to Denmark in 1812, and it has been supposed by some that it was not known till then in Europe, and that consequently Lestiboudois's name could not apply here. This is of course an unjustifiable deduction, since we know that the plant was in Europe in the time of Jussieu and Lamarck, and was cultivated in many French and Italian gardens prior to its description by Hornemann. It has also been generally supposed that it came from Mexico; Hornemann, however, is careful to indicate that its origin was to him unknown. We know now that its Mexican origin is as mythical as that of *A. mexicana* itself, and that it must have been introduced from South-eastern America, where alone it occurs in a wild state. The exact date I have not, however, been able to trace.

Before leaving *A. alba*, it is necessary to allude to another point. In the accounts of the genus *Argemone* it has been usual to speak of the perianth as variable. This statement requires some qualification. In the very large number of specimens examined by me in the various herbaria mentioned in the introduction I have only seen three specimens with a 4-merous perianth. These have been the specimens marked *A. alba* Juss. in Mr. Drake's herbarium, the specimen at Kew which is the type of the *Bot. May.* figure of

A. albiflora, and a wild specimen from Florida named by Chapman himself in Herb. Darand *A. mexicana, alba*. In not a single specimen of any of the other forms of *Argemone*, whether white-flowered or yellow-flowered, has the phenomenon been met with; all the flowering examples have three sepals and six petals. It is noteworthy, too, that in his description of *A. Georgiana*, Mr. Croorn states that this form is often 8-petalled in Georgia. We have thus a very odd corroboration of the identity of the garden *A. alba* with the plant of the South-eastern States; whether we have in the character an additional plea for the treatment of *A. alba* as a good species I must leave to others to decide, though I am myself inclined to believe that we have. In any case it is necessary to emphasise the fact that, so far as my research goes, this tendency to tetramery is confined entirely to this form, and is met with in wild as well as in cultivated examples. The statement that the flower in *Argemone* may be 4-merous is thus, if used as a generic character, exceedingly misleading, and has therefore been deliberately omitted from the text of the generic description.

There is some dubiety as to the locality of one of the specimens quoted) this dubiety is explained by Sir W. Hooker (*Journ. Bot.* i. 183). Mr. Drummond journeyed through Alabama to Louisiana, collecting as he went; there is a locality Covington in both States, but it is not clear from Mr. Drummond's notes which of the two is meant. When the plants were received, Sir William thought it was Covington, Alabama; when they were published, he was inclined to think that the Louisiana Covington was intended.

4. ARGEMONE GRANDIFLORA Sweet. *Glabra glaucescens, ramis ascenduntibus gracilibus undique sparse foliosis cauleque inermibus, foliis herbaceis sinuato-pinnatifidis margine lactucoideo-acutilobis vix spinosis, venis albidis; floribus supra bracteas 1-2 foliaceas versus apiceni ramorum plus minus elongatorum dispositas in cymis 3-6-floris subpaniculatis terminalibus; sepalis 3 sub apicem in cornu teretiforme omnino herbaceum laeve productis, extus glabris; petalis 6 magnis albis basi late cuneatis apice truncatis; capsulis angustius fusiformibus 4-valvis, stylo distincto, valvis crasse coriaceis inermibus vel aculeis perpaucis medianis tantum obsitis; seminibus globosis distincte reticulatis.* *Argemone grandiflora* Sweet, *Brit. Ft. Gard.* iii. t. 226 (1827); Lindl. *Bot. lieg.* t. 1264 (1829); Loddig. *Bot. Cab.* xvi. t. 1546 (1829); Hook. *Bot. Mag.* t. 3073 (1831); Otto & Dietr. *Allgem. Gartenzeit.* i. 300 (1833); VYalp. *Rep.* i. no (1842); Hemsl. *Biol. Centr. Amer. Bot.* i. 26 (1879).

— *America:* Mexico; Oaxaca, ad Mexitlan, *Ghiesbrecht in Herb. Paris* \ *Europe:* in hortis botanicis privatisque sropissime culta (v. sp. in *Hort. Bard.* I *Hort. Paris* I *llort. Kew* 1 *Hort. Genev.*! *Hort. Calcutta!* &c. culta).

Herbacea robustior annua biennis vel, ut videtur, nonnunquam perennis, 30-90 cm. alt., ramis floriferis 3-6-floris gracilibus 6-12 cm. longis; foliis radicalibus nonnunquam 25 cm. longis, 8 cm. totis, caulinis 8-15 cm. longis, 2-5 cm. latis; sepalis 2 cm. longis, cornubus 8 mm. longis, alabastris 1 cm. latis; floribus 10-12 cm.

latia; capsula 2-2.5 cm. longa, 1-6 cm. lata; stylo 3-4 mm. longo; seminibus 2-5 mm. latis.

This species has been known in European gardens since 1827, when it was first raised in the garden of Mr. E. Barclay, and was described and figured by Sweet. In certain herbaria, notably in Herb. Kew, where the types of Sweet's, Lindley's, and Hooker's figures are all preserved, also in Herb. Paris and in Herb. DeCandolle, the species is well represented; in others, notably the important Herb. Brit. Museum, there are no examples. It is, however, only the Paris Herbarium that is fortunate enough to possess? wild specimens that correspond exactly with the garden-plant so familiar in Europe. These show that it is native in South-western Mexico. Whether the fact that only one gathering of this has as yet reached Europe indicates that the form is rare, or that the province of Oaxaca has been but imperfectly explored, must be left to American botanists to decide.

This plant is very nearly related to *A. alia typica*; the differences between them have been already commented upon. It is the least prickly of all the known forms of *Anemone*; even the tips of the lobes of the leaves are often only weakly mucronulate, and it is unusual to find more than a few spines on the stem and branches. Whether it deserves specific rank will depend on the result of future research; the bibliography of this form and of *A. alba* var. *typica* exemplify, however, in a striking fashion the extent to which custom and the tendency to copy from our predecessors often outweigh in systematic botany the value of actual characters. In spite of the close alliance of these two forms, no one has ever formally united them. The relationship of both to the *Argemone mexicana* group of forms is much the same; indeed, *A. grandiflora* bears a far greater resemblance to *A. ochroleuca* than any specimen of *A. alba* that I have seen bears to true *A. mexicana*. Yet since 1834 not a single author has been found to admit the undeniable right of *A. alba* to specific rank, while during that period not one has refused to accede this rank to *A. grandiflora*.

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5. ARGEMONE INTERMEDIA Sweet. Glabra glaucescens, ramis ascenduntibus vel erectis gracilibus undique sparse foliosis cauleque inermibus vel aculeis patentibus armatis; foliis herbaceis sinuatis margine cnicoido-spinosis, venis albidis; floribus inter bracteas 1-2 versus apicem ramorum plus minus elongatorum (var. *typica*) vel perbrevium (var. *stenopetala*) dispositis singulis terminalibus; sepalis sub apicem in cornu crasse coriaceum pyramidale leve vel aculeis perpaucis obsitum (var. *typica*) vel teretiforme leve (var. *stenopetala*) productis; petalis albis vel raro albo-roseis oblongis basi angustatis apice (var. *typica*) truncatis vel rarissime rotundatis, vel (var. *stenopetala*) acutis; capsula late fusiformi 4-valvis, stylo distincto; valvis tenuibus reticulatis aculeis subaequalibus, vel daedalianis plus minus crassioribus, basi vix dilatatis obsitis; seminibus globosis minoribus distincte reticulatis.

Var. *typica*: floribus saepissime magnis vel majusculis, petalis apice truncatis vel rarissime rotundatis, sepalorum cornubus latis coriaceis, ramis floralibus elongatis. *Aryemone alba* James, *Lony's Exped.* ii. 149 (1823) [nomen prius sed praerogatum]. *A. intermedia* Sweet, *Hon. Brit. ed.* 2, 585 (1830). *A. corymbosa* Greene? *Bull* Calif. Acad.* ii. 59 (1886). *A. mexicana* James, *Am. Phil. Soc. Trans.* ii. 183 (1825); Torrey in Emory, *Hep.* 406 (1848); Engelm. *Wislizen. Rep.* 112, in parte (1848); Torrey & Gray, *Vac. & Rep.* iii. 159 (1855); Torrey, *Mex. Bound. Rep.* 81, omnino!

(1858); Porter, *Flor. Colorwl.* 6 (1874); Brifct. *Bull. Torrey Bot. CL ix.* 156 (1882); Kerber, *Sitzungsher. Bot. Ver. Brand*, xxiv. 35 (1882); Coulter, *Contrib. U. S. Nat. Herbm*, ii. 12, quoad plantam albifloram (1891), nee Linn. *A. mexicana* var. *aUnflora* Torrey, *Ann. Lye. N. Y.* ii. 166 (1828); Eaton & Wright, *N. Amer. Bot.* 134 (1840); Torrey in *Frem. Rep.* 87 (1845), et Marcy, *Rep.* 280 (1853); Torrey & Gray, *Pac. R. Rep.* ii. 125 (1854); Torrey, *Pac. R. Rep.* iv. 64 (1856); Gray, *Pac. R. Rep.* xii. 40 (1860); Kufftze, *Rev.* i. 13, syn. *A. hispida* exclus. (1891), nee DC. *A. Barclaiana* Loud. *Hort. Brit.* ed. 2, Suppl. 472 (1850), nee *A. Barcfayana* Penny. *A. hispida* Gray & Hook. *Vey. Rocky Alts.* 26; Hook. f. *Bot. Mag.* t. 6402 (1878), vix A. Gray. *A. platyceras* var., S. Wats. *Proc. Am. Acad.* xviii. 318 (1882). *A. platyceras* Oyster, *Bull. Torrey Bot. CL xiv.* 233 (1887), et xv. 214 (1888); Webber, *Amer. Natur.* xxiii. 633 (1889); Wats. & Coult. in Gray, *Manual*, ed. 6 59 (1890); Eydberg, *Amer. Natur.* xxv. 486 (1891). *A. albiflora* S. Wats. *Proc. Amer. Acad.* xxiv. 38 (1889), nee Hornem. *A. platyceras* var. *rosea* Coult. *Contrib. U. S. Herb.* i. 30, quoad Palmer n. 20 tantum (1891).

America: Nebraska; ad fl. Platte, Cooke in *Herb. Carey' Jones*, n. 218! Kansas, ad fl. Purgatoire, Bell, n. 144! Texas, Wallace in *Herb. Durand! Reversion*, n. 24! Nova Mexico; Organ Mts., Vasey, n. 12 1 Mexico borealis; ad fl. Kio Grande, Schott (Mex. Bound. Comm.), n. 23! inter Lareda et Bejar, *Berlandier!* Parras, Palmer, n. 20 (spp. floribus roseo suffusis) I California inferiore; apud Muleje, Palmer, n. 7 (spp. *parviflora!*)

Yar. stenopetala: floribus parvis subsessilibus, petalis anguste lanceolatis acutis, sepalorum cornubus angustatis teretiformibus. *Argemone platyceras* Pringle, *Pl. Mcx. exs.* n. 43 (1885), haudquaquam Link & Otto.

America: Mexico; Chilhuahua, Pringle, n. 43! (v. etiam sp. in *Hort. Cosson* cult.).

Herbacea gracilis, annua vel biennis, 30-90 cm. alta, ramis floriferis in var. *typica* 4-10 cm. longis, in var. *stenoprtalu* brevissimis; foliis 8-20 cm. longis, 2*0-4 cm. latis; sepalis 2*5 cm. longis, cornubus 6-8 mm. longis; alabastris 1 cm. latis, floribus in var. *typica* 6-8 cm., in var. *stenopetala* 2*5 cm. tantum latis; capsula 3-8-5 cm. longa, 1*5-2 cm. lata, stylo 2-4 mm. longo, seminibus 2 mm. latis.

This is, without doubt, the most troublesome of the white-flowered forms of *Argemone* to localise. As its bibliography shows, American botanists have usually placed it, when it comes from Texas or Mexico, in *A. mexicana*, but have been fairly evenly divided in their opinions, when they have received it from the prairies, as to whether it should be associated with *A. alba* or with *A. platyceras*. It does not, however, admit readily of association with either of these species, unless—and there is much to be said in favour of the view—it is looked upon as only a variety of a comprehensive white-flowered species that shall include *A. alba* and *A. platyceras* alike. The settlement of this question must be left to botanists in America, who have ample opportunities of deciding the

point. In the meanwhile it seems better to keep it apart as a species than to merge it in either of the others mentioned. From *A. alba* especially, with which it practically agrees in fruit, it differs in having the bracts close under the flowers, as in *A. mexicana* or in *A. platyceras*. In var. *tippiea* the calyx, except for the comparative absence of armature and total want of hispidity, is much like that of *A. platyceras* var. *hispidula*; in var. *stenopetala*, on the other hand, it agrees with that of *A. mexicana*, in fact it is more like it, moreover, all the habit, though it has a very different trait. Indeed, we have here again an instance of a plant which, had it been European, would undoubtedly have received specific rank; it is only from a desire not to increase unduly, in the absence of a more extensive suite of specimens, the already somewhat unmanageable list of proposed species, that it is denied the rank here. M. Cosson, on receiving specimens of the plant from Mr. Pringle, sowed some of the seeds; the plants reared by him are in his herbarium at Paris, and they show that the plant under cultivation retains all its distinctive characters; the petals particularly are the same small narrowly lanceolate organs that we find them to be in Pringle's original specimens.

From typical *A. platyceras*, with which the typical *intermedia* agrees, it differs in being much less aculeate; this, however, is only a relative character, and, though it readily admits of the separation of the plants in the herbarium, does not necessarily carry any great weight. The essential difference is in the fruit, which, like that of *A. alba*, has thin brittle valves very sparingly armed, instead of having hard, subligneous, very densely aculeate valves, as in *A. platyceras*.

A plant characteristic of the prairies and the "sand-draws" of Nebraska, Kansas, and Texas; its area, however, curves south-westward through New Mexico and Northern Mexico to Lower California. In the last-named locality it assumes a small-flowered condition parallel to the alteration that occurs in the same region in *A. ochroleuca*. And, if I am right in referring here *A. corymbosa* Greene, this small-flowered state extends northwards into the Mohave Desert. But there are no specimens of *A. corymbosa* in Europe, and the original description is so inadequate that it might apply equally to forms of *A. alba*, *A. intermedia*, or *A. platyceras*, no character being given that serves to diagnose it from any of these, just as Mr. Greene's excellent account in the *Flora Franciscana* of the Californian plant that is not separable from typical *A. platyceras* shows that he is thoroughly familiar with it, and as he has not reduced his own *A. corymbosa* to that species, it seems clear, in spite of some strictures by Mr. Brandegee on the subject, that Mr. Greene's plant cannot with justice be reduced to *A. platyceras*. The presumption which phytogeographical considerations afford is altogether against its being a form of *A. alba*; and, though the point will remain uncertain till Mr. Greene's *A. corymbosa* is fully described, it seems probable that it will require to be referred to *A. intermedia*, more especially since the form of this species identified by Mr. Watson as *A. albiflora* (Palmer, n. 7, which differs greatly,

however, from the true *A. albi* in the form of its sepals and buds) has also small flowers.

The name here adopted for the species is not the oldest, since this is the *A. alba* of James. As, however, that name is preoccupied for the South-eastern United States plant, we must employ the next in point of age. There is an apparent dubiety as regards this name, owing to its having been erroneously reduced by Loudon to *A. Barclayana*, which is a form of *A. ochroleuca*. A reference to the original description of *A. Barclayana* shows, however, that it had yellow flowers, and the specimen at Kew named *A. Barclayana* has flowers of that colour. Sweet's plant, as the reference to that name shows, had white flowers. We find, therefore, that Loudon was making the reduction which, under another name, has recently been made by Coulter; this treatment is parallel to that of the older European authors in the case of *A. mexicana* proper; just as Lamarck and DeCandolle united, from similarity of habit and in despite of differences in the flowers and fruit, *A. mexicana* and *A. alba*, so Loudon and Coulter, from the same consideration and in despite of corresponding differences, have united the two forms that really are *A. ochroleuca* and *A. intermedia*.

The species was introduced to Europe from Mexico in 1829 or 1830; its cultivation did not, however, continue. It was again introduced in 1878, and appears to have again been lost; curiously, the specimens which formed the basis of *Bot. Mag.* t. 6402, have not been preserved at Kew. That figure, however, and a garden specimen in Herb. Hale, grown at Larepe, in Wisconsin, show that the typical *A. intermedia* remains as true, under cultivation, to its characters in a wild state as do the other forms of *Argemone*. There are also specimens from Illinois in "Herb. Cosson," which I assume to be garden ones; I have therefore not cited Illinois among the localities in which the species is wild. If they be garden examples, they also show that the plant does not differ under cultivation from the form it assumes in the prairies further west. If the species is wild in Illinois, I cannot find any testimony to this effect in the writings of any American botanist.

It has to be pointed out to the objection which will be raised as to the reference here of *A. platyceras* of Watson and Coulter in the sixth edition of Gray's *Manual*, that the citation is deliberately made, in spite of the fact that their *description* applies *only* to *A. platyceras* var. *hispida* among the white-flowered forms of *Argemone*; the area covered by their work extends westward only to the 100th meridian; no specimens of the plant they describe from the east of that line have yet reached Europe; the plant reported from the area they indicate is the one described above; whatever its true position may be, the description given in the *Manual* will therefore have to be recast; it is certainly not *A. hispida*. What the white-flowered plant included by them under *A. mexicana* may be it is impossible to say; its existence at all is unsupported by any specimens in London, Paris, or Geneva.

G. ARGEMONE PLATYCERAS Link & Otto. Aculeatissima, foliis glaucescentibus, ramis suberectis cauleque undique densius foliosis

aculeis majusculis ssepissime numerosis retro patentibus undique munitis; foliis herbaceis sinuato-pinnatifidis nervis subtus aculeatis, margine cnicoideo-spinosis, floribus inter bracteas 2-3 foliaceas, versus apicem ramorum aggregatas terminalibus vel in cymis paucifloris dispositis; sepalis majusculis sub apicem in cornu latum extus aculeis obsitum productis; petalis magnis albis vel raro purpureis; capsulis cylindrico-ovatis 3-4-valvis, stylo brevi, valvis coriaceis extus dense aculeatis; seminibus globosis distincte reticulatis.

a. Var. *typica*: alabastris globosis sepalorum cornubus late triangularibus densissime aculeatis, petalis apice truncatis; planta glabra. *Argemone platyceras* Link & Otto, *Ic. Sel.* ii. 85, t. 43 (1827); Otto & Dietr. *Allgem. Gartenzeit.* i. 800 (1833); Coult. *Contrib. V. 8. Nat. Herb.* ii. 12 in parte, syn. *A. hispida* exclus. (1891); Colv. *Contrib. U. S. Nat. HerL* iv. 59 (1893). *A. alba* Eaf. *Flor. budov.* 83 (1817) [nomen prius sed praeoccupatum]. *A. hispida* Brew. & Wats. *Bot. Calif.* i. 21 (1876); Hemsl. *Biol. Cent. Amer. Bot.* i. 27 (1879), vix *A. Gray. A. platyceras* var. *ro&ea* Coult. *Contrib. U. S. Nat. Herb.* i. 30 (1890), Palmer n. 20 exclus. *A. munita* Greene, *Flor. Francisc.* 281 (1892), vix Dur. & Hilg. *A. mexicana* var. *hispida* Torrey, *Mex. Bound.* 21 (1856), vix *A. hispida* Gray. *A. mexicana* Engelm. in Wislitz. *Rep.* 87 (1848); Prantl & Kundig in Engler, *Nat. Pflanz.* iii. pt. 2, 135, fig. 83 B (1889), haudquaquam Linn. [*A. mexicana* var. *aculeatissima* Moricand MSS. *Chicalotl* Hernand. *Hist.* 215, quoad plant, floribus candicantibus (1651).]

America: Mexico; prope Vera Cruz, *Violet d'Aoust!*; prope oppidum Mexico, *Schaffner*, n. 19! *Mehedin!* *Andrieux*, n. 13! San Angel, prope Mexico, *Bourgeau*, n. 71; prope Tampico, *Andrieux*, n. 589!; inter Tampico et Real del Monte, *Berlandier*, n. 355! n. 594!; apud Real del Monte, *Galeotti*, n. 4770! San Luis Potosi, *Violet d'Aoust*, n. 547! Saltillo, *Palmer*, n. 19! California inferiore ad La Grulla, *Orcutt*, n. 5! United States; Texas, prope New Braunfels, *Trecul*, n. 1193!; inter fl. Brazos et Colorado, *Drummond* n. 9! (spp. *Trecul* et *Drummond* spinis ramosis!). N. Mexico, *Fendler*, n. 16 (quoad spp. fructigera partim)! Corpus Christi (spp. floribus purpureis), *Nealley!* Arizona, apud Tucson, *Parish*, n. 13! *Pringle* apud Huachuca, *Lemmon*, n. 2630! California, in montibus Sn. Bernardino, *Parish*, n. 188!; San Diego, *Palmer*, n. 10a! *Cleveland!*

? Var. *hispida*: alabastris globosis, sepalorum cornubus triangularibus densissime aculeatis; petalis apice rotundatis; planta hispida. *Argemone hispida* A. Gray, *Plant. Fendl.* 5, spp. fructigera spinis ramosis exclus. (1845); Walp. *Ann.* ii. 25 (1851); Torrey, *Staimb. Rep.* 383 (1852); Torrey, *Pac. R. Rep.* vii. 7 (1856); Durand, *Flor. Utah*, 158 (1860). *A. munita* Dur. & Hilg. *PL Heerm. in Journ. Acad. Phil.* ser. 2, iii. 37 (1855), et *Pac. R. Rep.* v. 5, t. 1 (1856); Walp. *Ann.* iv. 170 (1857), et vii. 85 (1868). *A. mexicana* Torrey, *Pac. R. Rep.* v. 359 (1857); Anderson, *Cat. FL Nevad.* 117 (1870); Porter, *Hayd. Rep. Geol.* 1870, 473 (1871), nee Linn. *A. mexicana* var. *hispida* Porter, *Hayd. Rep. Geol.* 1872,

759 (1878). *A. platyceras* Coult. *Bot. Rocky Mts.* 18 (1885); *Contrib. U. S. Nat. Herb.* ii. 12, quoad syn. *A. hispida* (1891), vix Link & Otto. *A. mexicana* f3. *albiflora* var. *hispida* O. Kuntze, *Rev.* i. 13 (1891).

America: United States; California orientalis (in ditione naturali, "Great Basin" nuncupat.), Williamson's Pass, *Heennann in Herb. Durand!* Mono Pass, *Lemmon!* Nevada, *Herb. Cosson!* Utah, *Jones, n. 1605!* Wyoming, apud Cheyenne, *McLean!* Colorado, prope Arkansas City, *Ciisack! Bell! Hooker & Gray!*; "In the plains," *Vasey, n. 205!* Nova Mexico, *Fendler, n. 16* (spp. florifera)! *Kern in Herb. Durand!* *Bell, n. 148!* *Rothrock, n. 75!*

y. Var. *chilensis:* alabastris oblongis, sepalorum cornubus anguste triangularibus sparsius aculeatis; petalis apice rotundatis; planta glabra vel rarissime hispida. *Argemone rosea* Hook. *Bot. Misc.* ii. 207 (1830); *Walp. Rep.* i. 110 (1842); C. Gay, *Flor. Chilen.* i. 100 (1845). *A. Hunnemannii* Otto & Dietr. *Ailgem. Gartenzeit.* 298 (1833); *Walp. Rep.* i. 110 (1842); C. Gay, *Flor. Chilen.* i. 101 (1845); Prantl & Kundig in *Engl. Nat. Pflanzenf.* iii. pt. 2, 141 (1889). *A. mexicana* C. Gay, *Flor. Chilen.* i. 110; var. f3. tantum exclus. (1845), haudquaquam Linn.

America: Chili; Arqueros, prope Coquimbo (sp. hispidum typ. *A. rosea*), *Cruickshanks in Herb. Hookerianum!* Coquimbo, *Lord Colchester]* *Bridges!* Valparaiso, *Cutning, n. 764!* *Gaudichaitd*_o n. 222 in parte (o. *A. ochroleuca* commixt., sub nom. *A. grandiflora* distrib.) t *Bertero, n. 601* *Edmonstone!* *Ph. Germain!* *Moseley!* Lampa ("Cardo bianco"¹ incol.), *Herb. Reed!* *Quilotta, Ph. Germain!* *Bertero!* St. Jago, C. Gay, n. S06 in parte (c. *A. ochroleuca* commixt., sub nom. *A. mexicana* distrib.)!

Herbacea, robusta, 45-120 cm. alta; foliis 8-25 cm. longis, 2*5-12 cm. latis; bracteis sub flores 2*5-4 cm. longis, 1-5-2-5 cm. latis; sepalis in var. *typica* et var. *hispida* 2*5 cm., in var. *chilensis* 8*5 cm. longis; cornubus 6-10 mm. longis, 4-6 mm. latis; alabastris 2-2-5 cm. latis; capsula 3-6 cm. longa, 1*5-2 cm. lata; valvis crassis spinis horridis dense obsita (in forma distinctiore var. *typica* in Texas et Nova Mexico crescente spinæ median*© magno-pere augmentatæ et ramosæ sunt), seminibus 2*5 mm. latis.

The three forms here grouped under *A. platyceras* are perfectly easily distinguished, and it would be equally satisfactory, so far as the material hitherto sent to Europe is concerned, to treat them as so many distinct species.

The true *A. platyceras* occurs in four more or less distinguishable states:—

a. That with broad sepal-horns, obtusely pointed and herbaceous throughout. This seems confined to Southern Mexico, and has been communicated to Europe by Andrieux, Berlandier, Schaffner, Mehedin, and Bourgeau. The ripe fruits of this form are not quite so densely aculeate as in the other North American forms. This is the true *A. platyceras* of Link & Otto, and is the *A. mexicana* var. *aculeatissima* of Moricand.

fl. That with triangular sepal-horns coriaceous towards the sharp point, which ends in a strong spine. This form occurs

throughout Central and Northern Mexico, and in Lower California, extending also throughout Arizona and Southern California. This is the *A. munita* of Greene, but not of Durand and Hilgard.

r. That with purple flowers, from Southern Texas, which otherwise does not seem to differ from form /?. I have not conserved Mr. Coulter's name of *A. platyceras* var. *rosea* for this form, partly because the name is made to include a form of what must be treated as another species, partly because the mere difference of colour does not satisfactorily separate the plant. The name should, if possible, be dropped, owing to the possibility of bibliographic confusion between this plant and *A. rosea* Hook.

*. That with extremely prickly capsules, the spines of the middle line of the valves being sometimes upwards of 25 mm. long, and much branched. This form occurs in Texas, where it was collected by Trecul near New Braunfels, and by Drummond; it forms part of the *third* communication by this unfortunate collector to Sir William Hooker, and therefore, though the specimens have no field-ticket, we know from the historical account in the *Bot. Misc.* that the specimens were collected somewhere, to Austin, between the Brazos and Colorado rivers. In Herb. Kew Mr. Planchon has proposed to consider this a distinct species, and had the plant been European, I should have felt little hesitation suggesting its distinction as *A. Phnchonii*; as it is, the matter must be left to American botanists to decide, and I leave the form for the present in *A. platyceras*, of which it has the foliage and the flowers. It has escaped notice that this particular plant has been mixed with *A. hispida* from the beginning, although it is not hispid, for Gray's original description covers the characters of fruit met with in this plant. In Herb. Kew, Herb. Paris, Herb. Drake, Herb. Oosson, Herb. Durand, Herb. DeCandolle, there are only flowering examples of Fendler n. 16, on which *A. hispida* is based. All these are hispid specimens, and all belong to the plant described here as var. *hispida*. The only fruiting example of Fendler n. 16 that I have seen is in Herb. Brit. Mus., and it is *not* the same as the flowering plant; it is this densely aculeate (but not hispid) plant with branching spines on the capsules.

In Herb. Durand there are good New Mexican examples of the true *A. hispida* in fruit. These show that that plant, at least normally, has fruits indistinguishable from those of the Northern Mexican and Californian form of *A. platyceras*, which are well represented, in &g. 86 B of Prantl and Kundig's account of the order *Papaveracea*, under the erroneous name of *A. mexicana*. The confusion that has existed among these forms has been extreme, and the only American authors who have appreciated the differences between these forms have been Mr. Colville, whose synonymy *A. platyceras* is the only one by any North American botanist, and applies without qualification of any kind to Link & Otto's plant, and Mr. Greene, who has definitely separated *A. hispida* from *A. munita* in his *Flora Franciscana*. But Mr. Greene has given the name *A. munita* of Durand to the plant common in Southern California; this is not admissible, because I believe that the

Californian plant cannot be separated from *A. platyceras* proper. Even if it were possible to treat form *jd.* of typical "*platyceras*" as a species, the name *A. munita* would still be inapplicable. From the figure and the description of Durand's plant it is certainly not possible to differentiate it from *A. platyceras*; the description does not mention, and the figure does not show, hispidity. Besides, Durand's plant came from California, and, as Mr. Greene justly points out, on that side of America *A. hispida* is confined to the Great Basin, and does not "overflow" into the true Californian region. However, we find that the exact locality of Durand's plant is Williamson's Pass, leading from the Great Basin to the llanclios of San Francisquito, so that we may as readily suppose it to have been the "Great Basin" plant as the Californian one. We know, moreover, that Lemmon has collected the hispid plant in Mono Pass. The matter is, however, set finally at rest by an examination of Durand's own herbarium in Herb. Paris. Not only has he written the name "*A. hispida*" on his copy of *Vac. Li. Rep.* v. t. 1; he has placed this plate in the same specific cover with a specimen of Fendler n. 16 and with specimens of the same hispid plant, collected by Kern and by Bell in New Mexico; more important still, he has in the same cover a piece of the plant collected in California by Heerman. This specimen is hispid, it has petals rounded at the tips, and is in fact the same plant as is represented by the flowering specimens of *A. hispida* (Fendler n. 10J). The name *A. munita*, therefore, does not apply to the plant so designated by Mr. Greene. While it is true, as Mr. Greene points out, that on the Californian side *A. hispida* does not leave the "Great Basin," this is not the case on the eastern side, where it extends beyond the limits of the Rocky Mountains into the plains of Wyoming and Colorado, so that it intermingles there with the form of *Aryemone* characteristic of the western prairies. The bibliography of that plant will show that in that area no attempt has been made to differentiate the two plants; the glabrous plant that is in this paper referred to *A. intermedia*, of which species it seems to be only a form, has even been figured under the name *A. hispida*. It is once more the duty of American botanists to decide whether it is possible to keep *A. platyceras* (*hispida*) and the very different form here included in *A. intermedia* specifically apart; if this is found impossible, it will then probably be necessary to merge *A. intermedia* and *A. platyceras* alike in *A. alba*.

As regards var. *chilensis*, separated, with a good deal of reason, as a species both by Sir Win. Hooker and by Otto and Dietrich, an examination of the original specimen on which *A. rosea* Hook. was founded shows that it is only a hispid example of the plant described two years later as *A. Hunnemanni* Otto & Dietr.; these two are not even varietally separable. The name *A. rosea* must therefore be used for the Chilean plant, if it is to receive specific rank. This name does not, however, really indicate the colour of the flowers; even in the original specimen they appear to have been white; they are exactly like those of examples noted as white in the field, and the specimens from the Sandwich Islands, included by Sir W«

Hooker in his *A. rosea*, have white flowers. But I cannot follow these authors in giving this plant more than varietal rank. Its very large sepals and large oblong buds certainly render it very easy, apart from its geographical separation, to distinguish this from the other white Argemones. But it has the habit and the capsules of the form of *A. platyceras* characteristic of Southern Mexico, and has petals a little larger than, but of the same shape as, those of *A. hispida*. The fact also that the presence of *A. ochroleuca* in S. America seems probably due to introduction by Spanish missionaries from Mexico renders it not improbable that this white form of Chili is also an introduction, and that its differences are merely the result of altered environment on what appears to be a species naturally very prone to react to the influences of soil and climate.

The name *chilensis* has been given to this variety in order to prevent confusion. As has been said, if it is to be recognised as specifically distinct, its name must be *A. rosea* Hook., in spite of the probability that the flowers are rarely, if ever, pink. At the same time it cannot as a variety be named *A. platyceras* var. *rosea*; that combination of epithets is preoccupied, owing to its use by Coulter to designate a *melange* of the purple-flowered form of *A. platyceras* (*typica*) and the pink-flowered form of *A. intermedia* (*typica*). To give the name *Hunnemannii* to the variety might seem like suggesting that the name of Otto and Dietrich should be preferred to that of Hooker; the one here adopted has consequently been employed.*

1007, *A. platyceras* was introduced into European gardens in 1807, and *A. rosea* flowered that year in Berlin. The Chili plant was introduced in 1883, and was also raised at Berlin; neither has been preserved in European culture. *A. hispida* and the form of *A. platyceras* with branched spines, from Texas and New Mexico, have never been introduced.

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A. platyceras type was introduced into European gardens in 1827, and flowered that year in Berlin. The Chili plant was introduced in 1833, and was also raised at Berlin; neither has been preserved in European culture. *A. hispida* and the form of *A. platyceras* with branched spines, from Texas and New Mexico, have never been introduced.

MICROTOENA CYMOSA *Train*.

LABIATAE. Tribe STACHYDEAE.

MICROTOENA *D. Train* (*gen. nov.*). *Calyx* 5-dentatus obscure sub-10-nervis subsequaliter 5-dentatus, fauce intus nuda. *Corollae* tubus longe exsertus supra medium ampliatus intus exannulatus, limbus 2-labiatus lobo postico erecto integro galeato, antico patente piano 3-fido lobo medio lateralibus multo minore. *Stamina* 4 aequilonga sub galea adscendentia, filamenta barbata, antherae juniores divaricatae demum confluentia uniloculares explanatae, filamentum apice decurvo nutantes. *Discum* anticum parum tumens. *Stylus* apice 2-fidus lobis inaequalibus, antico subulato, postico brevissimo. *Nuculae* apice ovatae, basi subtriquetrae, laeves.—Herba foliis oppositis dentatis. Cymae oppositae laxae thyrsoidae-paniculatae, bracteolis linearibus deciduis. Flores speciosi pedicellati. •

HAB. Assam; Khasia apud Sohra, 4,000 p.s.m. (cult.), Clarke, apud Shillong, Assam, 5,000 p.s.m. (cult.), Mann! Burma in collibus Shan, 4,000 p.s.m., ColUtt!

M. CYMOSA *D. Train* (*sp. unica*). Elata erecta ramosa minute tomentosa, foliis petiolatis late ovato-acutis basi subcordatis crenatodentatis, cymis laxae paniculatis, calycis dentibus triangularibus postico ceteros parum excedente; corollae tubo calycem duplo superante, galea cymbiformi fauce inferne minute 2-auriculata apice integra, labio lobo medio anguste elliptico subacuto lateralibus ovato-rotundatis multo minore, staminibus basi villosis, nuculis parvulus.—Plectranthus Patchouli Clarke MSS. in *Hook. f. Flor. Brit. Ind.* IV. 624.

Terennis, rhizomate serpente., caulibus usque ad 3-ped., ramis inferis 6-9-pollicar., foliorum petiolis $\frac{1}{2}$ – $\frac{3}{4}$ poll. laminis 2 poll. longis $1\frac{1}{2}$ poll. latis; calyce $\frac{1}{2}$ poll. ovoideo, fructifero, subgloboso; corollae tubo 4 poll. labio $\frac{1}{2}$ poll. galea 4 poll. longa 2 lata. antheris 1 poll. in alabastro divaricatis 2-ocularibus, mox confluentia unilocularibus demum explanatis anguste ovatis, rimis posticarum in flore nondum aperto subsursum directis, postea, uti rimae anticarum, deorsum spectantibus; pollinis micis minutissimis laevibus; nuculis «V P⁰^* simpliciter et comparate minoribus. In mese Novembri floret; corolla lutea.

Genus habitu foliisque *Graniotomi* accedib, calyce tamen *Cymwriae*, galea *Scutellariae*, antheris cum pari *Acrotomis* antico consentaneis, filamentis aequilonis a *Stachydeis* ceteris differentibus; labioque lobo medio minimo inter *Labiatas* sui juris longe recedit. Ovarium et fructus haudquaquam *Ajugoidearum*.—D. PKAIN.

[Ratio etymologica: nominis 'Craniotome' litterae anagrammaticae dispositae.]

Fig. 1. Aestivation. 2. Flower before expansion. 3. Ditto, after expansion. 4. Calyx, laid open, and pistil. 5. Half of corolla, from back. G. Anterior lip, open. 7. Stamens and style. 8. Young anthers. 9. Adult ditto. 10. Pollen-grain. 11. Ovary. 12. Nucules; enlarged.



A. D. Molla del.

MICROTOENA GYMOSA Pr*in.

A. C. Singha Lith.

A REVISION OF THE GENUS CHELIDONIUM

BY

David PRAIN

In the course of an extended examination of the natural order *Papaveraceae* which has occupied my attention during a visit to Europe it has been found necessary to enlarge considerably the limits of the genus *Chelidonium*. The reasons that have led to this extension will be made apparent in the course of the revision of species which follows; it will be sufficient for the moment to state that, as here understood, the genus is made to include not only the *Chelidonium* of the majority of recent writers, which has been admirably defined by Messrs Bentham and Hooker in the *Genera Plantarum* and by Mr Baillon in the *Histoire des Plantes* but also the genera *Stylophorum* of Nuttall, *Hylomecon* of Maximowicz and *Dicranostigma* of Hooker and Thomson. Of these three the last named has been reduced by its authors to *Stylophorum*; the second has also with its author's approbation been referred to the same genus. Recently, however, Messrs Prantl and Kundig have proposed to restore *Hylomecon* to a generic position and have inclined to the view that *Dicranostigma* should rather be referred to this resuscitated *Hylomecon* than to *Stylophorum*. It should be added also that both *Stylophorum* and *Hylomecon*, on the occasion of their first being described, were referred by their respective authors to *Chelidonium*; to this view Mr Franchet has recently returned.

That the four groups of forms indicated by these names must be very closely related will be clear from the above *resume* of the treatment they have received at the hands of the very able taxonomists by whom they have from time to time been examined and though it is

found on comparing them that the groups which the four names represent are probably all equally distinct, the characters which they exhibit interoscultate to such an extent that it seems absolutely necessary to treat them as no more than distinct sections of a highly natural genus to which, in a more comprehensive sense than hitherto, the name *Chelidonium* should be applied.

The incidence of this name *Chelidmium* has been at all times very variable. The plant known to the ancients as *χελιδονιον* (i^a) (Dioscorides) or *Chelidonia major* (Pliny) was associated with another which is now referred to *Ranunculus*. The taxonomists of the sixteenth and seventeenth centuries were, however, at one in rejecting this latter plant and only the *Papaveraceous* species, under the name simply of *Chelidonia*, used from the time of Brunfelsius (1537) to that of J. Bauhin (1651), or more frequently under the name of *Chelidonium majus*¹ with or without some further qualifying epithet, was retained in the genus. The name *Chelidmium majus* first used by Fuchsius in 1543, having been adopted by Linnaeus in 1753 in the work from which our present system of nomenclature for species dates, is that still applied to the plant. The early taxonomists must therefore be accorded the merit of having not only corrected an erroneous impression on the part of the ancients but of having preserved throughout a fairly natural limitation for the genus.

At the commencement of the eighteenth century a change occurred. Tournefort who in 1700 first defined the genus with something approaching to precision, nevertheless marred its natural character by including in it not only the group of forms that we now-a-days deal with as constituting varieties of *Chelidonium majus*, but also the very distinct North American plant which forms the very natural genus *Sanguinaria*. Ray, another extremely able taxonomist, proposed on the other hand in 1724 to reduce *Chelidmium* to *Papaver* itself. But this widening of signification for the genus *Papaver* does not commend itself more than does the suggestion of Tournefort, so that Linnaeus was amply justified when in 1737 he retained *Chelidonium* as a genus and gave generic rank to *Sanguinaria*. Linnaeus however only removed one confusion to introduce a still greater one since he merged in his *Chelidonium* the genus *Glaucium* proposed by Tournefort. For Tournefort's *Chelidonium*

¹ It is to be noted that this particular combination of epithets conserves the Greek generic name but adopts the Latin trivial one.

being, like his *Chelidonium*, a mixture of two genera, the *Chelidonium* of Linnaeus is therefore a conglomeration of three natural genera — the true *Chelidonium* as represented by *C majus*, the true *Glaucium*, and the genus *Bcemeria*.

Lamarck in 1784 followed Linnaeus exactly; so evidently did Necker in 1790; Necker's mention of the fact that the capsule in his *Chelidonium* may be 3-valved proves conclusively that he still included in it the genus *Bosmeria*, since *Chelidonium diphyllum*, the only true species in which this character occurs, was not yet described or known.

Gaertner in 1791 once more removed Tournefort's *Glaucium* from Linnaeus' *Chelidonium*; by so doing he reverted to the sixteenth century view which limited *Chelidonium* to the group of forms known as *Chelidonium majus*. Gaertner then is the author and 1791 is the date, since the advent of our present system of nomenclature, of the first unimpeachable definition of the genus. Ventenat in 1794 followed Gaertner as to *Chelidonium*; it is however to be noted that Ventenat includes in the re-established *Glaucium* the genus *Bcemeria*. This Gaertner does not do, and though it is true that he has not accounted for *Bcemeria* at all, it is not probable that he intended to do so; otherwise, his definition of *Glaucium* must have failed. For, though there is little to be said in favour of Dr Kuntze's view that there is but one species of *Glaucium*, nothing is more certain than that the inclusion in *Glaucium* of forms devoid of a pseudo-replum violates the limits of one of the most natural genera among *Papaveraceas*; moreover, the genus *Bcemeria* has nothing in common with the genera of the *Chelidonium* group with which it has been usual to associate it. The natural allies of *Bcemeria* are *Cathcartia*, *Meconopsis* and *Papaver*, particularly the group of species which includes *P. pavoninum*, *P. hybridum* and *P. Argemone*. To this group *Bcemeria* bears precisely the relationship that *Cathcartia villosa* bears to *Meconopsis chelidonifolia*, while to *Cathcartia* as a whole, *Bcemeria* bears exactly the relationship that *Papaver* as a whole bears to *Meconopsis*.

Willdenow in 1799 returned, — not unnaturally, seeing that he was engaged in re-editing Linnaeus' great work — to the Linnean confusion; but with the end of the eighteenth century the impossible proposal to include *Glaucium* in *Chelidonium* may be said to have disappeared.

If however the confusion with regard to the original species has disappeared the advent of new species has given rise during the nineteenth century to quite as much dubiety and confusion. The greatest

leptopodum. That it is no *Olatidium* is certain from the complete absence of any dissepiment in the capsule. The most distinctive character of this species is its laxly paniculate inflorescence, but this is deprived of any generic significance by the recent discovery in Szechuen of a third species of the *Dicranostigma* section which is not only intermediate as to locality but as to inflorescence and as to ovary, between the other two species while it repeats the habit of both.

There seems therefore to be not only ample justification, but an absolute necessity, for the reduction to *Chelidonium* of *Stylophorum*, of *Hylmneon*, and of *Dicranostigma*.

The plant described by De Candolle as *Chelidonium sinensis*¹ is not at present identifiable; it cannot well be a *Chelidonium*. Loureiro's description seems to accord best, among Chinese *Papaveraceae*, with that of a *Meconopsis* of the section *Chelidoniifolia*.

Chelidonium *Tournef.* Flores 2-meri receptaculo conico apice piano; sepala libera imbricate decidua; corollae 2, luteae, petalis utriusque conformibus imbricatis deciduis; stamina 6 hypogyna filamentis filiformibus vel medio parum dilatatis antheris basifixis extrorsum 2-rimosis; gynaeceum 2-mero (rarissime 3-4-mero) carpella in germen cylindricum (raro ovatum) coalita, placentis 6-ovulatis nerviformibus, stylis plus minus elongatis prorsus fuis stigmatibus tantum apice discretis cum placentis alternantibus et stigma marginale lobis cum placentis plane alternis sinibusque placentas opponentibus formantia, matura valvis placentas cum stylo persistentes nudantibus usque ad basin dehiscentia; semina nitida raphe cristate, vel minutissime punctulata raphe subnuda.

Herbae rhizomate perenni, succo croceo. Folia radicalia pinnatifida, caulina pauca vel 0, floralia saepissime subopposita. Flores fasciculati bracteolati, fasciculis pedunculatis vel sessilibus, vel cymosi ebracteolati, cymis simplicibus vel iterum cymosis.

Species ad 8; 6 sinenses, 1 himalaica, 1 americana; singula tamen per regiones temperatas utriusque orbis late inquilina.

§ **I. Euchelidonium** : Folia radicalia pauca, caulina alterna, floralia 0; caulis cymosim ramosus; flores bracteolati, pedicellis ad apicem pedunculorum oppositifoliorum fasciculatis; capsula glabra.

¹ *Chelidonium majus* Loureiro (nee Linn.) *Flor. Cochinchin.*, 330 (1790).

Species 1, varietatibus 3 distinctioribus, Asiae orientalis; in Europa, et in America tamen late inquilina.

Chelidonium Tournef. Inst. Rei Herb. 254, syn. *Sanguinaria eocodus*. (1701).

§»H **Stylophorum** Franch., *Journ. de Bot.* VIII, 293 (1894): Folia radicalia pauca, caulina 0 vel raro pauca alterna, floralia 2 subopposita terminalia; caulis simplex; flores bracteolati, pedicellis inter folia floralia fasciculatim aggregatis; capsula molliter puberula. Species 3; 2 sinenses, tertia americana.

Stylophorum Nutt. Gen. II, 7 (1818).

§ III. **Hylomecon** Prain: Folia radicalia pauca, caulina 0, floralia 2 subopposita subterminalia vel 3-4 alterna; caulis simplex; flores ebracteolati, pedicellis cymosim dispositis vel summis 2 (rarissime 3) pseudo-aggregatis; capsula glabra. Species 1; japonico-sinensis.

Hylomecon Maxim. Prim. Fl. Amur. 36 (1858).

§ IV. **Dicranostigma** Prain: Folia radicalia numerosa, caulina 0. floralia 3-4 alterna; caulis simplex; flores ebracteolati, pedicellis cymosim dispositis simplicibus vel iterumramosis; capsula molliter puberula vel glabra. Species 3; 2 sinenses, tertia himalaica.

Dicranostigma Hook. f. et Thorns. Flor. Ind. 255 (1855).

§ I. EUHELIDONIUM.

1. Chelidonium majus Linn.; glaucous glabrous or puberulous; rootstock slender fibrous; radical leaves few long-petioled pinnatifid, segments distant obovate-oblong, rarely lanceolate, obtusely rarely acutely toothed, terminal lobe deeply 3-fid, lateral pinnatifid; stem tall branching leafy, leaves conformable to radical but with shorter petioles and larger blades, with long leaf-opposed slender leafless branches terminating, like the apex of the stem, in a fascicle of long-pedicelled flowers; sepals small ovate very sparingly puberulous or glabrous; flowers small or medium, yellow, pedicels bracteate at the base; ovary glabrous, linear, style distinct, stigmatic lobes small erect; capsule narrowly cylindrical, tapering upwards, glabrous; seeds small, numerous, shining, smooth, crested.

Var. *typica*; usually glabrous, radical leaves few disappearing, cauline numerous; stems usually tall slender; segments of leaves obovate-

others, it must be admitted that so far as the specimens from the area which includes Soongaria, Dahuria and Mongolia are concerned, it would be impossible to deny specific rank to the plant. In Szechuen however all the characters break down and we find in that province plants intermediate in every respect between *C. grandiflorum* and *C. majus*. Similarly intermediate are certain forms from Japan, where *C. majus* does not as in Europe vary in the direction of evolving a new type, but seems to vary in the direction of a reversal to its ancestral condition. For there is no doubt that in the area indicated above (Soongaria, Dahuria, Mongolia) *C. grandiflorum* is a truly wild species, and it is extremely probable that we see in this form the original stock from which the plant known in Europe as the « Greater Celandine » has been derived. Indeed the existence in the Herbaria of Kew and Paris of all the necessary intermediates from Szechuen and Central China demonstrate the transition almost with certainty.

The occasional record of *C. grandiflorum* from European localities must be discounted; hitherto, at all events, no example of the true Mongolian *C. grandiflorum* has been found in Europe; all the European specimens issued under the name are no more than luxuriant states of *C. majus*. In *C. grandiflorum* the flowers though usually larger than those of *C. majus* are by no means always so; though *C. grandiflorum* is always puberulous this is not distinctive, since at times we encounter puberulous forms of *C. majus*; finally we sometimes meet in Europe with examples of *C. majus* that have large obtuse bracts. It will thus be seen that, even if the series of distinct intermediates reported from Szechuen did not exist, it would still be difficult to separate *C. grandiflorum* and *C. majus* as unequivocal species.

We find in Cis-baicalia that the true *C. majus* occurs; its presence therefore in a region immediately to the north and west of the area occupied by the « sylvestrian » form of the species, perhaps indicates that the « civilized » form with which we are familiar in Europe was independently evolved on both sides of its original area. But there are absolutely no intermediate forms from Siberian localities and it is perhaps more probable that, after having been evolved from *C. grandiflorum* in Central China, the « Celandine », having found its way northwards to Manchuria, then spread westward to South Siberia simultaneously with its passage eastward to Japan.

The further progress westward from Siberia of *C. majus* is, I believe, indicated by its distribution. That it is only introduced from Europe

in North America is admitted by all authors; indeed the date of introduction has been definitely, and probably accurately, assigned to the middle of the seventeenth century. Its occurrence in at least three groups of Atlantic Islands is also no doubt the result of comparatively recent introduction; probably as in the case of America the introduction has been deliberate and has been brought about owing to the belief that exists in the medical properties of « Celandine » juice. And a consideration of the habitat of the plant in Europe itself shows that it is probably not indigenous in Europe at all. It is a purely « civilized » species — a plant, in other words, of the « garden escape » or « weed » category — in every European country; and in spite of its having been known in Europe from very remote times the probability is that it is only an importation from Asia brought about during one or other of the later Aryan immigrations. It is extremely interesting to find that in those parts of Asia where it occurs most commonly (Central and Northern China, Manchuria and Japan) it is, exactly as in Europe, only as a « civilized » never as a truly « sylvestrian » species that it occurs; old walls and roadsides, there as in Europe, are the localities in which it occurs. It is worthy of note that *C. majus* has not as yet been reported from Southern or South-western China, or from any part of Indo-China, Malaya, India or Persia; the only examples from Asia Minor are from Anatolia, where the plant has probably been introduced from Europe.

The variety *laciniata* as here defined is a somewhat composite one. It is made to include not merely the forms with lacinate petals which constitute the true *C. laciniatum*, but those with petals entire which exhibit the foliage always characteristic of the form with fringed petals; these last are really intermediate between *C. laciniatum* proper and *C. inajus* and demonstrate the necessity of uniting the two plants specifically. There seems to be no room for doubt that this form has originated since the appearance of *C. majus* in Europe; it appears to be a good example of a « species » in the course of being evolved.

The stigmas of this species have been often erroneously described as being opposite the placentas; on this misapprehension has been based the generic distinction between *Chelidonium* and *Stylaphornn* where the stigmatic lobes, though of exactly the same nature as those of *Chelidonium* proper, have been generally, and accurately, spoken of as being alternate with the placentas. The inflorescences and the branch system in *C. majus* are purely cymose; the organs generally described as peduncles are in reality a succession of definitions from below upwards

of the main stem, and of the subsequent branches that appear in succession in the axil of what is a subapical leaf like the leaves of the species of *Siyhphorum*. The only difference between the sections *Euchelidonium* (*C. majiis*) and *Stylophorum* is the presence of an internode between the leaf and the aggregate of bracteate pedicels constituting the inflorescence proper in the first named, and the absence of this internode in the second.

§ H. STYLOPHORUM Franch.

2. *Chelidonium sutchuense* Franch.; glaucous puberulous; rootstock slender fibrous; radical leaves few long-petioled pinnatifid segments distant subfalcate acute irregularly toothed, terminal lobe 3-fid; stems with 4-7 short-petioled alternate cauline leaves and 2 subopposite **almost** sessile apical floral all conformable to the radical; apex of stem supporting a fascicle of long pedicelled flowers; sepals medium ovate acute puberulous; flowers large yellow, pedicels bracteate at base; ovary puberulous with soft weak hairs ovate-oblong, style long, stigmatic lobes small erect; capsule narrowly ovate-oblong acute, softly puberulous: seeds blackish ovate, crested.

Chelidonium sutchuense Franch. *Journ. de Bot.* VIII, 293 (1894).

China: Szechuen, at Tchen-keou-tin, Farges ii. 9151

Rootstock 1 $\frac{1}{2}$ in. long, heads $\frac{1}{6}$ in. wide; stems 12-15 in. long; radical leaves 11 in. long, 3 $\frac{1}{2}$ in. wide, petioles 3 in. long, segments 4-5-jugate; cauline 9 in. long, 3 $\frac{1}{2}$ in. wide, petioles 1 in. long, segments 3-4-jugate; floral 2 $\frac{1}{2}$ -5 in. long, 1 $\frac{7}{8}$ -2 in. wide, segments 2-3-jugate; sepals $\frac{1}{3}$ in. long, buds $\frac{1}{4}$ in. diam.; flowers 1 $\frac{1}{2}$ in. across, pedicels 2 in. long, bracts $\frac{1}{4}$ in. acuminate; capsule (including style $\frac{1}{4}$ in.) $\frac{3}{4}$ -1 in. long, $\frac{1}{4}$ in. wide.

In foliage this closely resembles *C. lasiocarpum* Oliv., which species moreover occurs in the same locality; the fruit however is quite different and is in fact hardly distinguishable from that of the North American *C. diphyllum* though it does not, as in that species, appear to have ever more than two placentas. So far as its fruit goes this is almost exactly intermediate between these **two** species and indicates very clearly the necessity of treating them as congeneric. Its scattered stem leaves as the other hand make it intermediate between both species and *C. nmjiis*, and indicate the necessity of merging all three in *C. chelidonium*.

3. *Chelidonium lasiocarpum* Oliv.; glaucous puberulous; rootstock rather slender tufted; radical leaves few long-petioled pinnatifid segments distant subfalcate acute irregularly toothed, terminal lobe 3-fid; stems 2-3 from each stock, leafless below but with 2 short-petioled apical floral leaves conformable to the radical usually subopposite but sometimes separated by an internode; apex of stem supporting a fascicle of long-pedicelled flowers and when the second leaf is remote from the highest with a second fascicle in its axil; sepals small ovate acute puberulous; flowers medium yellow, pedicels bracteate at the base; ovary puberulous with soft weak hairs linear, style long, stigmatic lobes rather large subpatent: capsule narrowly cylindrical softly puberulous: seeds small numerous ovate, crested.

Chelidonium lasiocarpum Oliv. in Hook. *Icon. Plant*, t. 1739 (1887).

China: Hupeh; Nan-t'o Mts, Henry n. 3885! Szechuen; Tchen-keou-tin, Farges!

Rootstock 1-1 $\frac{1}{2}$ in. long, heads $\frac{1}{4}$ in. diam.; stems 4-15 in. long; radical leaves **12-18** in. long, $3\frac{1}{2}$ in. wide, segments 6-7-jugate, petioles 3-4 in. long; floral 4-8 in. long, 3-5 in. wide, segments 6-7-jugate, terminal lobe very large $4\frac{1}{2}$ in. long, $3\frac{1}{2}$ in. wide; sepals $\frac{1}{2}$ in. long, buds $\frac{1}{4}$ in. diam.; flowers $1\frac{1}{2}$ in. across, pedicels 3-4 in. long, bracts acuminate $\frac{1}{2}$ in. long; capsule (including style $\frac{1}{3}$ in. long) 2-3 in. long, **1/6-1/5** in. diam.

This interesting species has the foliage of *C. sidehuense* to which it is obviously very closely related; it differs however in fruit. In the disposition of its leaves this most resembles the American *C. diphyllum*; at the same time the occasional separation of the apical floral leaves, with a corresponding subdivision of the terminal fascicle of pedicels into two, shows that we have here essentially the same arrangement as in *a vnajw* only with sessile instead of peduncled fascicles.

4. *Chelidonium diphyllum* Michx; glaucous puberulous, rootstock slender fibrous; radical leaves few very long-petioled pinnatisect segments distant rounded obtusely lobed, terminal lobe 3-fid; stems leafless below but with 2, less often 3, subopposite apical petioled floral leaves similar to the radical; apex of stem supporting a fascicle of long-pedicelled flowers; sepals large ovate puberulous; flowers large yellow pedicels bracteate at the base; ovary puberulous with soft weak hairs ovate 4-(rarely 3-, very rarely 2-) valved, style long, stigmatic lobes small erect; capsule ovate, softly puberulous; seeds small numerous crested.

Chelidonium diphyllum Michx, *Flor. N. Amer.* I, 309 (1803); Pers. *Synops.* II, 61 (1807); Poir. *Suppl.* II, 209 (1811); Pursh, *Flor. N. Amer.* II, 365 (1814).

Stylophorum diphyllum Nutt. *Gen.* II, 7 (1818); Spreng. *Syst.* II, 570 (1825); Don, *Gen. Syst.* 1.135 (1831); Dielr. *Syn.* III, 223 (1843); Gray, *Gen.* 1, 114. t. 48 (1848); Hook. *Bot. Marj.* t. 4867 (1855); Lesquer., *Fl. Arkans.* 348 (1860); Gray. *Manual* Ed. V, 25 (1866), Ed. VIII, 59 (1878); Chapm. *Flor. S. Unit. St.* Ed. II, 605 (1883).

S. petiolatum Nutt. *Gen.* II, 8 (1818); Don, *Gen. Syst.* 1, 135 (1831); Dietr. *Syn.* III, 223 (1843).

5. *ohioense* Spreng. *Syst.* II, 570 (1825).

Meconopsis diphylla DC. *Syst. Vey.* II, 88 (1821); *Prodr.* I, 121 (1824); Torrey, *Compend.* 216 (1826); Eaton, *Manual* Ed. VI, 221 (1833); Torrey and Gray, *Fl. JV. Am.* 1, 61 (1838); Eaton and Wright, *N. Am. Bot.* 315 (1840); Walp. *Bep.* I, 110 (1842); Beck, *U. S. Bot.* 20 (1848); Wood, *Bot. and Fl.* 32 (1871), *Class-Book* 224 (1880).

Uf. *petiolata* DC. *Syst. Veg.* II, 87 (1821); *Prodr.* I, 121 (1824); Torrey, *Ann. Lye. N. Y.* II, 165 (1828); Eaton, *Manual* Ed. VI, 221 (1833); Beck, *U. S. Bot.* 20 (1848).

North America: Eastern United States; not uncommon.

Rootstock 1 V» in long heads * / 3 in* across stems 9-45 in long S; radical leaves 6-16 in. long, lamina 7 in. long, 5 in. wide, petioles 6-9 in. long; segments 2-(rarely 3-) jugate basal pair rather smaller, lateral 1 y*-3 in. long, 3/4-2 in. wide end lobe 2-3 in. long, 2-3 in. wide; floral (occasionally 3 instead of 2 [= *S. petiolatum*]) with petioles 1 7*-\$ in. long, lamina 1-jugate (basal smaller segments absent); sepals 1/3 in. long, buds 1/4 in. diam.; flowers 1 7»ⁱⁿ across, pedicels 2-3 in. long, bracts ovate acute; capsule (including style 1/7-1/5 in.) 1 in. long, 1/3 in. diam.

Besides its isolated distribution, the chief peculiarity of this species is its usually 4-valved capsule. In habit it closely resembles *C. lasiocarptmi* but it has very differently shaped leaves which more resemble those of (*7. majus*). The 4-valved fruit serves to connect the genus as a whole and the tribe to which it belongs with the *Eupapaverex*. There is no difference between the two species distinguished by Nuttall.

§ III. HYLOHECON Prain.

5. *Chelidonium japonicum* Thunbg; green, glabrous or when young sparsely puberulous; rootstock short slender oblique scaly, 2-4 headed; radical leaves few very long-petioled, pinnatisect segments approximated oblong-lanceolate or subrhomboid acutely serrate or

lacinate, terminal lobe incised or 3-fid; stems solitary from each head of rootstock, leafless below, simple with two, rarely three, more rarely four floral leaves conformable to the radical above, the upper two unequal always subopposite, the smaller sessile; apex of stem supporting a terminal flower subtended by the smaller sessile leaf and wi(Ji usually a second in the axil of the larger, and a third if the third leaf when present is also subopposite or if, it being remote, there is a fourth lower down — the lowest leaf is usually sterile; sepals small ovate acute glabrous; flowers large yellow, pedicels bractless; ovary glabrous linear, style long, stigmatic lobes small erect; capsule narrowly cylindric, tapering at apex, glabrous; seeds small numerous smooth shining crested.

Var. *typica*; leaf-segments serrate.

Chelidonium japonicum Thunbg, *Flor. Japon.* 221 (1784); Willd. *Sp. PL* II, 1142 (1799); Pers. *Synops.* II, 61 (1807); Poir. *Supp.* II, 209 (1811); DC. *Syst. Veg.* II, 100 (1821); *Prodr.* 1,123 (1824); Spreng. *Syst.* II, 570 (1825); Dietr. *Synops.* III, 224 (1843); *Ann. d'Hortic. Pays-Bas* II, 113 c. ic (*Flor. des Jardins*) (1859).

6'. *uniflorum* Sieb. and Zucc. *Abh. Acad. Muench.* IV, 2. 169 (1846); Regel, *Bull.Soc. Mosc.* XXXIV, 134(1861); *Tent. Fl. Ussur.* 19 (1862); *Gartenflora* XI, 89. t. 355 (1862).

Stylopiorum japonicum Miq. *Ann. Mus. Bot. Lugd. Bat.* III, 11 and *Prolus. Flor. Japon.* 199 (1857); Franchet and Savatier, *PL Jap.* 1, 27 (1875); Bak. and Moore, *Journ. Linn. Soc.* XVIII, 378 (1879); Forbes and Hemsl. *Jour. Linn. Soc.* XXIII (*Ind. Sinens.* I) 34 (1886).

Utlomecon vernale Maxim. *Mem. Sav. Etr. Acad. Petersb.* IX (*Prim. Flor. Amur.*) 36. t. 3 (1858).

H. japonicum Prantl in Engler, *Natūr. Pflanzenfam.* III, 2. 139 (1891).

Japan: Manchuria: Northern and Central China; common.

Var. *dissecta* Franch. and Savat.; leaf segments deeply lacinate.

Stylophorum japonicum var. *dissectum* Franchet and Savatier, *Enum. PL Japon.* 127 (1875).

Japan: China: Szechuen, at Tchen-keou-tin, Fargesl

Rootstock 1/2-2 in. long, heads 1/4-1 in., scales 1/4 in. diam.; stems 8-12 in. long; radical leaves including petioles 5-9 in. long, segments 3-jugate basal pair usually distinctly smaller 1-1 1/4 in. long, 1/2 in. wide, the two lateral pairs 2 1/2-3 in. long 1-1 1/2 in. wide, floral leaves 2-jugate from absence of the smaller basal pairs of segments petiole of larger apical 1/2-1 in. of lower (if present) 1/2-2 in.; sepals 5/8 in. long; buds 1/4-1/3 in. diam.; flowers 1 1/2 in.

across; pedicels 2-3 in. long; capsule (including style $1/5-1/4$ in. long) 2 7'-3 in. long; seeds very similar to those of *C. majus*.

The habit of this species often so much resembles that of *Stylophorum* that it has been by most authors included in that genus. In reality however its inflorescence is a genuine cyme and this coupled with the absence of specialised bracts at the base of the pedicels serves to indicate that it stands almost midway between *Dicranostigma* as a whole and *Stylophorum* as a whole, thus serving to show that these latter are congeneric. At the same time it has seeds very like those of *C. nutjus* and a fruit similar to that of *C. majus* and of the *Dicranostigmas* except *C. Dicranostigma* itself. It thus serves to connect on the one hand *Dicranostigma* and *EiicMidonium* and on the other *Euchelidonvum* and *Styfophorwm*.

§ IV. DICRANOSTIGMA Prain.

6. *Ghelidonium Dicranostigma* Prain; glaucous puberulous; rootstock stout fusiform descending apex enlarged; radical leaves many petioled pinnatifid to partite, segments usually distant rhomboid acutely incised-lobed, terminal lobe 3-fid; stems several leafless below sparingly fastigiately branched above, apex of stem and of each branch supporting a terminal flower; branches, occasionally with 1-2 sterile floral leaflets, or rarely a second flower, near the middle, in the axils of floral leaves conformable with the radical but sessile and smaller; sepals large ovate acute puberulous; flowers medium orange, pedicels bractless; ovary narrowly ovate acute, puberulous with soft weak hairs, style long stigmas mitraeform lobes large erect acute; capsule cylindrical tapering softly puberulous, seeds small numerous ovate pitted but not scrobiculate and not crested.

Dicranostigma lactucoides Hook. f. and Thorns. *Flor. Ind.* 255 (1835); Walp-Ann. IV, 272 (1857).

Stylophorum lactucoides Baill. *Hist. des Plantes*, III, 114 (1871); Hook, f. and Thorns. *Flor. Brit. Ind.* I, 119 (1872).

Himalaya: Kamaon; Strachey and Winterbottom n. 3! Duthie nn. 26991 3819! 5326! Phari; King's Collector!

Rootstock 4-6 in. long, apex $1/2$ in. diam.; stems 4-10 in. before branching; radical leaves 5-9 in. long, 1-2 in. broad, petioles $1/2-2/3$ in., segments 4-6-

jugate; floral leaves 2-3 in. long, 1-1 7/8 in. broad, segments 2-4-jugate; sepals 3/4 in. long, buds 1/3 in. diam., flowers 2 in. across, pedicels 2-3 in. long.; capsules (including style 1/5 in. long) 2 1/8 in. long, 1/4 in. wide or less.

This very interesting species, which like the two that follow it, has the habit of a *Ghutium*, is distinguished from all the other species by the large size of its stigmas. In other respects its fruits closely resemble those of the true *Btyhphora* with which it has by Baillon, by Bentham and Hooker, and by its original authors, been associated. As to inflorescence — a simple cyme with bractless pedicels — it serves to connect *C. Franchetianum* and *C. leptopodium* with *C. japonicum* which in turn connects *Dicranostigma* as a whole on the one hand with *C. mtchuense* (as to habit) and the other with *C. majw* (as to fruit and seeds).

7. *Ghelidonium Franchetianum* Prain; glaucous, puberulous; rootstock stout fusiform descending apex enlarged; radical leaves many petioled pinnatifid, segments distant rhomboid acutely incised-lobed, terminal lobe 3-fid; stems many leafless below, sparingly branched above; apex of stem supporting a terminal flower, each branch again cymosely dividing and with a sessile semi-amplexicaul 5-7-lobed leaf with acute segments at its base; sepals large ovate acuminate spatulate at the tip, glabrous or puberulous; flowers medium orange pedicels bractless; ovary linear glabrous, style short, stigmatic lobes small erect; capsule linear, subequal throughout, glabrous with a line of small prickles along each placental rib.

China: Szechuen; Tachienlu, Pratt n. 217! Bonvalol n. 142! Kia-la, Soulie* i
Rootstock 1/2 in. diam., stems 4/8 in. long before branching; radical leaves 8 in. long 1 1/2 in. broad, petioles 2 in., segments 4-6-jugate; floral leaves 1-1 1/2 in. long, 2 1/2 in. wide; buds 1/3 in. diam.; flowers 2 in. across, pedicels 1 in. long; capsules 2 1/8-3 in. long, 1/8 in. wide, seeds (immature) not crested.

Almost exactly intermediate between *C. Dicranostigma* and *C. leptopodium*, repeating exactly the habit of the first and closely following the structure of fruit of the last. Its style of inflorescence stands midway between that of the other two *Dicranostigmas*.

The species is named in honour of the illustrious M. Adrien Franchet, who has done so much to increase our knowledge of the Flora of South-western China.

8. *Chelidonium leptopodum* Prain; glaucous puberulous; rootstock stout fusiform descending, apex enlarged; radical leaves many petioled pinnatisect, segments distant rhomboid acutely incised-lobed, terminal lobe 3-fid; stems many leafless below copiously fastigiate-ly branched above; apex of stem and of each branch supporting a terminal flower; branches in the axils of small 3-5-partite floral leaves with acuminate sparingly-toothed segments; sepals small ovate acute glabrous or puberulous; flowers small yellow, pedicels bractless; ovary cylindrical tuberculate; style short, stigmatic lobes small erect; capsule narrowly cylindrical slightly tapering at both extremities, glabrous; seeds small numerous ovoid-apiculate pitted but not scrobiculate and not crested.

Glaucium leptopodum Maxim. *Bull. Ac. Imp. Petersb.* XXIII, 310; *Mel. Biol.* IX. 714 (1876).

China; Kansu; Potanin 1

Rootstock 4 in. long, apex 1/2 in. diam., stems 4-8 in. long before branching; radical leaves 5-6 in. long, 1 in. broad, petioles 1¹/₂ in., segments 4-6-jugate; floral leaves 1/2 in. long, 1/6 wide or less, segments 1-2-jugate; sepals 1/4 in. long, buds 1/5 in. diam.; flowers 1/2-3/4 in. across, pedicels 1 in. long; capsule (including style 1/8 in.) 1 7/8-2 in. long, 1/6 in. wide.

This has no trace of the pseudo-replum of a *Olavdum*; its stigma moreover is exactly that of *Oielidonium*; through the intermediation of *C. Franchetianum* it is clearly a *Dicranostigma*, while the structure of its fruit shows that *Dicranostigma* as a whole is not generically separable from *Chelidonium*.

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Extrait du *Bulletin de la Sociéti botanique de France*,
Tome xlii, séance du 14 juin 1895.

LB GENRE *MIGWKENA*, par M. PEAIN.

Dans les collines de cette partie d'Assam située au sud et à Test du fleuve Brahmaputra, croît une *Lahie* plus ou moins connue depuis soixante ans, mais qui n'a pas été décrite par aucun botaniste anglais jusqu'au temps où Sir J. D. Hooker rangea les *Labiées* des Indes anglaises dans le *Flora of British India*, IV (1885). Le Dr. W. Griffith paraît être le premier qui ait trouvé* cette plante en 1836 près de Negrigam, village Naga situé dans les montagnes où le thé (*Gamellia theifera*) croît à l'état sauvage. L'étiquette du seul spécimen ne mentionne que la localité et la date. Cet échantillon est à Kew et, parce qu'il est unique, n'a pas été distribué comme les autres plantes de l'herbier de Griffith.

Quelques années après, M. le major Jeukins, gouverneur d'As-

sam, la trouva dans un autre endroit du même territoire; son échantillon ne porte ni la date ni la localité précise. Mais, quoiqu'il ne soit pas certain qu'il provienne de Naga ou de Khasia, nous savons au moins que ce spécimen doit avoir été récolté de 1839 à 1845. Comme le dernier, cet échantillon est unique 6* est aussi conservé à Kew.

Le troisième échantillon trouvé est dans Pherbier de M. Drake del Castillo à Paris; il fut récolté dans Tile de Java, en 1845, par U. Zollinger. Sur Pétiquette est écrit le nom de *Gomphostemma* sp.; 11. Zollinger est donc le premier botaniste qui ait tenté de classer Pespèce, quoique MM. Zollinger et Moritzi n'aient pas mentionné le numéro (Zollinger, n. 2936) dans leur *Systematisch. Verzeichn.* Comme les précédents, le spécimen de Zollinger est unique.

Une trentaine d'années après, Pespèce fut retrouvée (août 187J) dans les collines de Khnsia par M. Clarke; Pétiquette des échantillons porte la note: ((cult, in Khasia and said to be the true *Patchouli*; it has the true *Patchouli* scent which *Pogostemon* has not;). Ces spécimens (Clarke, n. 15983), avec Pechantillon de Jenkins mentionné ci-dessus, sont ceux cités dans le *Flora of British India*, iv, 624, sous le nom de *Plectranthis Patchouli* Clarke.

M. B. C. Henry trouva, en 1884, la même plante dans la province chinoise de Kwang-tung. M. Hance en donna la description dans le *Journal of Botany* XXII, 231, sous le nom de *Gomphostemma insuave*.

En novembre 1885, M. Clarke retrouva la même espèce sur le col de Haitook Mokong, dans le petit fitat de Manipur situé entre Assam et Burma. Il en parla encore dans le *Journal of the Linnean Society*, XXV, 58, sous le nom de *Plectranthus Patchouli*, en mentionnant que M. Oliver avait exprimé l'avis que la plante était peut-être une *Cymaria*.

Récemment M. Balansa a trouvé l'espèce au Tonkin; M. le général Collett Pa rencontrée dans les États Shan biraaniens; M. le baron Lamington Patrouvée dans les fitats Shan siamois, et M. Ford dans la province de Kwang-tung.

Jusqu'à ce moment, nous avons donc trois propositions concernant la position de cette espèce; celle de M.* Zollinger et de M. Hance qui font de la plante un *Gomphostemma* et par conséquent une *Prasiée*, celle de M. Clarke en faisant un *Plectranthus*

et par conséquent une *Ocimo'idée*, eijfin celle de M. Oliver y voyant un *Gymaria* et par conséquent une *Apigoidée*.

En 1887, je fus envoyé d'office pour examiner le Patchouli du commerce cultivé dans les ((Straits Settlements)) de Perak et de Pemng, et à cette époque je remarquai quelques spécimens de la plante cultivée dans la Khasia, envoyés k l'herbier de Calcutta par M. Gustave Mann. Je trouvai donc que cette plante n'est pas le vrai Patchouli, ni *Plectranthus*[^] ni *Oomphostemma* (1), ni *Cymaria* Don plus; elle me parut être une Stachydée d'un genre inconnu jusqu'alors. Pour ce genre je proposai le nom *Microlcena* (2); la description fut publiée, apr&s un intervalle de deux ans, dans les *Icones Plantarum*, XX, tab. 1872 (1889);

Avant que la description de *Microlcena* fût publid, j'avais trouvé une autre espèce dans l'herbier de Calcutta, récoltée en 1836 dans les montagnes Mishmi par le Dr. Griffith et, en 1845, dans l'Assam supérieur par M. J. Masters. Mais le seul dchantillon de cette espèce à Kew étant sans fleur, il n'était guère possible d'en donner U description dans les *Icones*. Les échantillons à Calcutta sont complets; pour cette raison la description fat publiée dans le *Journal of the Asiatic Society of Bengal*, lix, pt. 2 (1890).

En 1889, M. Hemsley découvrit deux autres espSces du genre de la Chine centrale (province Hupeh), et M. Pranchet m'a montré que ces deux espftces existent dans les collections de M. Farges du Szechuen oriental. Il m'a montré aussi une cinquième espèce k deux variétés bien distinctes, récoltée dans le Yunnan, par Tillustre M. Delavay. Il m'a informé de plus que le *Clerodendron moupinense*, récolte `a Moupine par U. Tabbé David, est du mSme genre.

M. Pranchet a désiré que j'examine tontes les esp^ces et que je compare les échantillons de Pherbier du Muséum avec ceux conservés dans les herbiers de Kew et du British Museum. J'ai donc le plaisir de présenter h la Société apr&s examen nécessaire, des descriptions complètes et conformes concernant ces six espèces.

(1) Je savais, h l'époque de la premiere publication, quo *Yeapbce* était supposée être *Plectranthus* on *Cymaria*, mais je ne connaissais pas qu'elle avait été décrite sous le nom de *Gomphostemma*.

(2) L'&y-mologie est ainsi expliquée dans les *Icones* de Hooker; Ratio etymologica: nominis *Craniotome* littor® anagrammatice disposita (Hook. *Icon, plantar.*, vol. XIX, part III, pi. 1872),

MICROTCENA PBAIN

Hook. Icon. Plant, XIX, t. 1872; Baill. Hist. des Plantes, XI, 43.

NAT. 0. LABIATH, TRIB. STACHYDEJJ.

Calyx 5-dentatus obscure 12-nervis fauce intus nuda. *Corollse* tubus longe exsertus fauce' ampliatus intus exannulatus, limbus 2-labiatus lobo postico erecto integro galeato antico patente plane 3-fido lobo medio integro quam laterales plus minus angustiore. *Stamina* 4, sub-
 ©quilonga vel plane didynama anticis longioribus, sub galea adscen-
 dentia inclusa vel parum exserta filamentis parte inferiore barbatis
 antheris junioribus divaricatis demum confluentibus 1-ocularibus
 explanatis filamentorum apice decurvorum nutantibus. *Discum* antice
 parum tumens; *stylus* apice 2-fidus lobis inrequalibus, antico subulato,
 postico brevissimo. *Nuculce* apice ovatro basi subtriquetr© laves.

E&rbse perennes elat© erect© robust©, rhizomate et nonnunquam
 etiam caulis basi sublignosis; *foliis* longe petiolatis membranaceis plus
 minus hirsutis; *floribus* cymosis, cymis axillaribus terminalibusque,
 laxe paniculatis vel densius thyrsoides, bracteis parvulis subdeciduisi;
calycibus fructigeris auctis dente poslico ceteros ssBpius plus minus
 excedente; *corollm* tubo labioque luteis albis vel roseis galea fauce
 utrinque srepius 2-auriculata, seepissime rosea purpurea vel rubro-bru-
 nea, nonnunquam tamen corolla concolore lutea; *staminum* insertione
 anticorum intervallo ab ea posticorum plus minus disfcincto remota, an-
 theribus posticis in alabastro subsursum sed sub anthesin anticisque
 deorsum spectantibus; *disco* fructigero haud incrassato, nuculis srope
 1-2, nonnunquam omnibus abortis.

Genus ad *Graniotomen* et *Anisomehn* proxime accedens, nunc hano
 Dune illam habitu inflorescentiaque simulans, ab ambabus tamen long©
 discrepat. Species sex sinenses vel indo-sinenses; singula tamen etiam
 in insula Java sed ibi forsitan inquilina occurrit.

CLAVIS SPECIERUM.

- Labii lobo medio angusfce lingueiformi. 1. if. *cymosa*.
 Labii lobo medio orbiculato vel elliptico:
 Oymis dense thyrsoides. 2. if. *Griffithii**
 Cymis laxis:
 Calycis deute summo ceteros fere 2-plo superante:
 Corollre tubo labioque albis, galea rubra. 3. if. *Delavayi*.
 Corolla lutea. 4. if. *urticifolia**

Calycis dentibus fere requilongis:

Calycis dentibus anguste lanceolatis..... 5. *If. moupinensis*.

Calycis dentibus oblongis..... 6. *M. robusta*.

1. *Microtoena cymosa* Prain.

Elata erecta ramosa minute tomentosa, foliis ^etiolatis late ovato-acutis basi subcordatis, truncatis, vel interdum cuneatis margine crenato-dentatis seiTatisve, cymis laxepaniculatis; calycis dentibus triangularibus postico ceteros parum excedente; corollft tubo fere prorsus ampliato calycem dupio superante labioque lobo medio anguste lingureformi subacuto lafceralibus ovato-rotundatis multo minore luteo, galea cymbiformi fauce inferne utrinque late auriculata brunnea vel purpurea raro lutea; staminibus fere sequilongis.

GomplioSTEMMA insuave *Hance, Journ. bot., xxii, 231 (1881)*.

Plectranthus Patchouli *Clarke in Hook, f. Flor. Brit. Ind., iy, 624 (1885); Journ. Linn. Soc. xxv, 58 (1889)*.

Cymaria ? sp. *Oliv. ex Clarice in Journ. Linn. Soc., xxv, 58 (1889)*.

Microtoena cymosa *Prain in Hook. Icon. plants xix, 1.1872 (1889); Journ. As. Soc. Beng., lix, pt. 2, 310 (1890)*.

Microtrona cymosa *Forbes et Hemsl, Journ. Linn. Soc. xxvi, 306 (1890); Coll. et Eemsl. Journ. Linn. Soc. xxviii, 116 (1890); Baillon, Exit, des Plantes, xi, 43 (1892)*.

CHINA : Kwang-tung; apud Ting-tat, *B. C. Henry (Herb. Hance propr. n. 22237)* | ad fl. anglice l(North River)) nuncupat., *Fordii mercenar** n. 24! INDO-CHINA: Tonkin; inter Ta-shap et ((Roches de Motre-Dame)), *Balansa*, n. 3582! Choloo, *Balansa*, n. 3583! in monte Bavi vallis Lankok, *Balansa*^ n 3584! Shan; in ditione Shan siamense apud Bau Mik Sao, *D^m Lamington!* in ditione Shan birmannica ad Fort Stedman, *Collett*, n. 921! Manipur; in jugo Haitook Mokong, 1100 m., *Clarke*, n. 42119! Assam; in collibus Naga apud Negrigam, *Griffith!* in ditione Assamica sed loco exacto haud notato, *Jenkins!* Ehasia apud Solira, 1300 m., cult., *Clarke*, n. 15983!; Shillong, 1500 m., cult.; *Mann!* MALATA : Java; Bondowosso, ad Ardosatte montis Ranu, 750 m., *Zollinger*, n. 2933!

Perennis rhizomate repente sublignoso caulibus usque ad 90-120 cm. rarais inferioribus 20-30 cm., foliorum petiolis 2-5 cm. longis, lamina 5-8 cm. longa hac 4 cm. lata, calyce 2,5-3 mm. fructigero 6 mm. longo hoc 3 mm. lato subgloboso, corolla) tubo 6 mm. longo, galea 8 mm. longa, labio 7 mm. longo; nuculis vix 2 mm. longis.

Microtema cymosa est une espèce très distincte par l'extrême étroitesse du lobe milieu de la lèvre inférieure de la corolle.

L'étiquette de réchantillon de Griffith porte seulement la localité et la date, celle de réchantillon de Jenkins porte seulement: ((Assam: Jenkins)). Sur l'étiquette de réchantillon de Clarke de 1871, nous lisons: ((Sohra, 4000 feet; cultivated in Khasia and said to be the true Patchouli)). Concernant les échantillons récoltés dans Manipur, M. Clarke dit (*Journ. Linn. Soc*, XXV", 58) (v: This was collected in the middle of the jungle at the Haitook Mokong, but just on the ridge where the path crosses it and I suspect it may have been planted even here)). Dans l'Assam, la plante a toujours l'odeur de Patchouli et a presque toujours aussi toutes les quatre petites nucules abortives. Peut-être donc la plante est seulement introduite dans l'Assam, et dans le Manipur.

Dans le Shan birmanien la plante n'a pas l'odeur de Patchouli; elle semble être dépourvue aussi des nucules. Dans le Shan siamois, elle n'a pas non plus de nucules; l'étiquette porte la note: <(sweet musky odour)). Probablement donc l'espèce est également introduite dans le territoire Shan. Comme la plante assamoise, celle de Shan est de corolle jaune avec le casque teinté de brun.

Quant à la plante du Tonkin, cela est différent. De trois échantillons récoltés par Balansa, un, trouvé dans les lieux déboisés de la vallée de Lankok, a la corolle jaune teintée de brun, exactement, comme la plante d'Assam; ce spécimen a plus ou moins l'odeur de Patchouli, ses feuilles sont semblables à celles de la plante assamoise, ses nucules semblent être entièrement abortives. Mais les deux autres (l'un trouvé à Choloo, l'autre récolté aux bords de la route conduisant de Ta-Shap aux Roches de Notre-Dame) ont les corolles simplement jaunes et les feuilles d'une forme un peu différente: les deux n'ont pas l'odeur de Patchouli et ont les nucules bien développées. Je crois donc que, dans le Tonkin, la plante est, sinon toujours, du moins dans quelques endroits, vraiment sauvage.

La plante de Kwang-tung paraît aussi être sauvage. Les échantillons de Henry décrits par Hance ont la corolle jaune avec le casque pourpre au lieu de brun; cette forme dit H. Henry, a une ((odour strong and unpleasant)). Ses feuilles sont conformes à celles de la plante tonkinoise, sans odeur, ses nucules sont bien développées. Les échantillons de Ford ont les feuilles un peu dif-

soèrentes, et exactement semblables à celles de la plante du Shan foirmanien: comme cette dernière, les feuilles manquent d'odeur, mais ses nucules sont généralement bien développées, quoique quelquefois une ou deux soient abortives. Il se peut donc que, dans le sud de la Chine, la plante soit quelquefois vraiment sauvage.

Il est possible que, dans Tile de Java, l'espèce ne soit qu'introduite. Il est vrai que les feuilles de l'cliantillon manquent d'odeur, mais le spécimen est d'un âge très avancé et l'odeur s'est, sans doute, plus ou moins évaporée. Il est vrai aussi que les corolles sont simplement jaunes, que les nucules sont bien développées et que les feuilles sont semblables de forme à celles de la sorte du Tonkin, qui est probablement sauvage. Mais il est un fait très remarquable, c'est que personne après Zollinger n'a trouvé une espèce si curieuse dans cette île; ce fait, joint à la circonstance que nous trouvons dans Java beaucoup de colons chinois qui ont pu introduire l'espèce, me porte à croire que la plante est étrangère à Java; du moins il n'est pas possible de dire qu'elle soit une espèce vraiment malaisienne.

Je savais, en 1889, quand je publiai le nom *Microtana cymosa*, qu'une épithète spécifique ((*Patchouli*)) existait déjà. Néanmoins ce nom doit être abandonné, non parce que le mot est bizarre, mais parce qu'il a été appliqué, à cause d'une opinion erronée, que cette plante est le vrai Patchouli du commerce. Le Patchouli est un *Pogostemon* (1); pour cette raison la désignation est ici inacceptable. Cependant je ne connus pas à cette époque l'existence d'une autre épithète encore plus antérieure, c'est-à-dire le nom *insuave* de 1884. Sans spécimens il était impossible de supposer qu'une plante, qui est réellement une *Stachydée*, eût été attribuée au genre *Gomphostemma**

La règle est juste que, dans un cas où il est nécessaire de nommer quelque espèce nouvelle, l'épithète la plus ancienne devra

(1) Le patchouli ne peut être cultivé dans la presque totalité des Indes est *Pogostemon Patchouli* Pelletier qui est une sorte cultivée de *Pogostemon Heyneanum* Benth.; le Pacha-pat, très soigneusement cultivé par les colons chinois de la presque totalité malaisienne et qui donne la plus grande partie du Patchouli du commerce, est, tout à fait différent de la plante de M. Pelletier. Le Pacha-pat est en effet, *Pogostemon suave* Tenore qui n'est que *Pogostemon Cablin* Benth. des Philippines, probablement seulement une sorte cultivée de *Pogostemon parviflorum* Benth. des Indes.

être conserve; mais cela n'implique pas, je crois, aucune nécessité pour un autre changement, si, à l'époque où l'espèce était placée dans son vrai genre, il eût été impossible de dire qu'elle avait été déjà attribuée à tort à un autre. Pour cela donc, je refuse absolument d'être responsable de la combinaison des épitjètes ((*Microtoena insuave*)), et je suis curieux de savoir qui, après cette indication de la pseudonyme combinaison et en face de ce désaveu, aura la hardiesse de proposer le changement mentionné.

2. *Microtoena Griffithii* Prain.

•
Elata erecta ramosa glabriuscula, foliis petiolatis late ovatis acuminatis basi cuneatis margine duplicato-crenatis utrinque glabrescentibus; cymis dense thyrsoides; calycis parce hirauti dentibus lanceolatis postico ceteros vix excedente; corollas lutete tubo calycem duplo superante, galea cymbiforme fauce vix auriculata labio 3-fido lobo medio elliptico lateralibus rotundatis dimidio minore, staminibus fere sequilongis.

Microtoena Griffithii Prain, *Journ. As. Soc. Beng.*, lix, pt. 2, 310 (1890).

Labiata, n. 4059, *Herb. Qriff.* ex *Herb. Kew distrib.*

ASSAM: In montibus Mishmi, *QriffUh!* ad Dibroo Mukh, *Masters* n. 1072!

Rhizoma sublignosum incrassatum, caulis subteres 40-100 cm. altus; ramis inferioribus 15-20 cm. longis; foliorum petiolis 4-5 cm. longis, laminis 7-9 cm. longis, his 4-7 cm. latis; pedunculis 5-8 mm. tantum longis, thyrsis terminalibus 5-8 cm. longis; calyce 5 mm. longo, fructigero aucto 6 mm. longo; corollae tubo 11 mm. longo, galea 5 mm. longa labium aequante; nuculis 3 mm. longis.

Cette espèce est bien distincte par ses cymes étroites et par la petite étendue des auricules de la levre supérieure de la corolle. Il est possible que l'échantillon de Masters, récolté dans la vallée d'Assam, fournisse un cas de croissance sporadique, grâce au transport des graines du haut des montagnes par quelque rivière; en tout cas, M. Gustave Mann, qui, à ma prière, a exploré très soigneusement la localité indiquée par M. Masters, n'a pu retrouver l'espèce. Personne, après M. Griffith, n'a herborisé dans le Mishmi me me.

3. *Microtoena Delavayi* Prain.

•
Elata erecta glabrescens, foliis petiolatis ovatis acuminatis vel acutis

^{sof}*si cordatis vel truncatis margine crenatis utrinque glabrescentibus,
^{for}/mis laxis longe pedunculatis, calycis glabrescentis dentibus lanceolatis»
 o-*postico ceteros fere duplo excedente, corollae tubo labioque albido
 calycem duplo superante galea rubra cymbiforme fauce utrinque obtuse
 auriculata labio trifido lobo medio spathulato-rotundato lateralibus di-
 midio angustiore, staminibus fere sequilongis.

a. *vera*; foliis late ovatis acutis margine grosse crenatis, galea la-
 bioque aequilongis quam tubum dimidio brevioribus.

CHINA : Yunnan; Hokin in angustis apud San-Tchang-Kiou in silvis,
Delavay, n. 2463!

!?. *Yar. grandiflora*; foliis angustioribus acuminatis margine crenis
 minoribus; galea labioque maximis tubum aequantibus.

CHINA : Yunnan; Ta-long-tan prope Ta-pin-tze, alt. 1800 m. in silvis,
Delavay, n. 2190! n. 4206!

Rhizoma deest; caulis subteres vel 4-sulcatus, angulis rotundatis,
 100 cm. altus; ramis 25-30 cm. longis teretibus, foliorum petiolis 5-8 cm.
 longis, laminis 8 cm. longis, his 5-7 cm. latis; pedunculis teretibus
 ? 5 cm. longis, cymis 3-5 cm. latis; calyce 6 mm. longo, fructifero
 valde aucto, 12 mm. longo; corollae tubo 10-12 mm. longo, galea labium
 aequante in *M. Delavayi (vera)* 6 mm., in var. *grandiflora* 10 mm.
 longa; nuculis 3 mm. longis.

Cette espèce est la plus voisine du *M. Griffithii*; mais elle est
 très différente par ses cymes amples, par ses pédoncules arrondis
 et par ses feuilles échancrées au lieu de sésues. La variété *gran-
 diflora* est très distincte du type; *M. Delavayi* a été trouvée dans la
 même localité, en 1886, et encore en 1893. Lorsque plus d'échan-
 tillons auront été envoyés, il sera peut-être nécessaire de recon-
 naître dans cette plante une espèce distincte; en ce cas elle mé-
 ritera bien le nom de *if. grandiflora*.

4. *Microtoena urticifolia* Hemsl.

Elata, erecta, ramosa, parce pilosa; foliis longissime petiolatis ovatis
 vel cordato-ovatis saepe longe acuminatis basi cordatis truncatis vel
 interdum cuneatis margine grosse serratis utrinque parce strigillosis;
 cymis paucifloris laxiusculis breve pedunculatis; calycis dentibus lan-
 ceolato-deltaeideis acuminatis postico ceteros duplo excedente; corollae
 flavae tubo siphonantho recto angustissimo calycem triplo superante,
 galea cymbiforme fauce utrinque insigniter acute auriculata labio trifido

lobo medio rotundato lateralibus fere cequilato, staminibus anticis m
Difesto longioribus; nuculis ovatis.

Microtaena urticifolia *Hemsl. hum. Linn. Soc.* xxvi, 308 (1890).

CBINA : Suchueu orientalis, apud Kouan-Kouan-te, prope Tchen-keou-
tin in silvis, alt. 4500 m., *Farges*, n. 1192 bis! Hupeh; ia Pdung,
Henry, n. 2536! n. 7339!

Rhizomata desunt; caulis tetragonus ut videtur usque ad 100 cm.
altus; foliorum petiolis 5-12 cm. longis, lamina 7-10 cm. longa, his
5-7 cm. latis; peduncula tetragona 1-3 cm. longis; calyce 6-7 mm.
longo, fructifero aucto 8-10 mm. longo, 5-6 mm. lato; corolla tubo
20 mm longo, galea 10 mm. longa quam labium 7 mm. longum dis-
tincte longiore; nuculis 2-5 mm. longis.

Espèce voisine de *M. Griffithii*, mais très distincte par le tube
de la corolle beaucoup plus long et par les auricules du calice
beaucoup agrandies.

5. *Microtaena moupinensis* Franch.

Elata erecta ramosa pube duplici conspersa pilis aetulosia; folia par-
tialia late ovato-cordata acuta basi apertis margine crenato-dentata
supra parce subtus praesertim nervis densius setulosa; cymis
paucifloris densis ad axillas foliorum superiorum breviter pedunculatis;
calycis dentibus lanceolato-deltaeideis acuminatis rectis vel medianis
utrinque uncinatis omnibus subaequilongis; corollae purpureae tubo
biphonantho antice leviter curvato calycem quadruplo superante, galea
cymbiforme fauce utrinque acute auriculata, labio trifido lobo medio
rotundato lateralibus fere aequilato; staminibus anticis manifeste lon-
gioribus.

Microtaena moupinensis *Frich. mss. in Herb. Paris I*

Clerodendron moupinense *Franch. Plant. David*, ii, 106 (1888).

TIBET ORIENTALIS : Moupine, ad oras silvarum et secus campos,
David!

Rhizomata desunt; caulis basi sublignosus usque ad 60 cm. altus;
foliorum petiolis 3-4 cm. longis, lamina 5-6 cm. longa, his 3-5 cm.
latis; pedunculis 3-5 mm. tantum longis; calyce 7 mm. longo, tubo
4 mm. (fructifero ignoto); corollae tubo 25 mm. longo, galea auriculis
parum apice reflexis 10 mm. longa quam labium 8 mm. longum dis-
tincte longiore (nuculae ignotae).

Cette espèce est très voisine de *M. urticifolia*; elle diffère par

son calice à dents presque égales, par ses feuilles à bases cordiformes et par la couleur pourpre de sa corolle.

Microticena robusta Hemsl.

Herba erecta ramosa undique molliter pubescens foliis petiolatis late ovatis acutis basi sinuato-triuncatis margine crenatis utrinque molliter pubescentibus; cymis densis breviter pedunculatis in paniculas terminales axillaresque dispositis; calycis pubescentis dentibus oblongis acutis subaequilongis; corollae rosae tubo subsiphonantho recto calicem 3-4-plo superante, galea cymbiforme fauce utrinque obtuse auriculata labio trifido lobo medio rotundato lateralibus fere sequilato; staminibus anticis manifesto longioribus.

Microticena (1) *robusta* Hemsl. *Journ. Linn. Soc.* xxvi, 307 (1890).

CHINA : Suchuen orientalis; apud Kouan-Kouan-te prope Tchen-keoutin in silvis, alt. 4500 m. Farges, n. 1192! Hupeh; apud Hsing-shan, Henry, n. 6482! ad Fang, Henry, n. 7631!

Rhizoma incrassatum; caulis tetragonus usque ad 160 cm. altus. foliorum petiolis 4-10 cm. longis, laminis 5-15 cm. longis his 4-10 cm. latis; paniculis terminalibus axillaribusque simillimis 8-15 cm. longis; pedunculis tetragonis 6-12 mm. longis, calyce 5 mm. longo fructifero aucto basi rotundato 8 mm. longo, hoc 5 mm. lato; corollae tubo 16-20 mm. longo, galea 8 mm. longa, labium 8 mm. longum sequante; nuculis 2-5 mm. longis.

Cette espèce est bien distincte de toutes les autres; elle est odoriférante comme le *III*, *cymosa*; l'étiquette des échantillons de Henry porte la note : ((whole plant odorous)); sur celle de l'échantillon de Farges nous lisons : ((plante à odeur de muse, utilisée comme désinfectant)). M. Farges dit que le nom chinois de la plante est *Chee'Kiang'tsao*.

(1) M. Prain nous a fait remarquer que ce terme avait été imprimé *Microtis* dans le *Journal of the Linn. Soc.* (Voy. l'étymologie plus haut, p. 419, note 2); cependant, par un scrupule d'exactitude, il nous a prié de conserver cette mauvaise orthographe dans la citation des auteurs qui l'avaient adoptée. (*Note du Secretariat*)

THE GENUS *PSILOTUM* Sw., in India.

A note in this *Journal* (Vol. VII, p. 644) by Dr. Dalgado records the occurrence of this genus in Savantvadi. This is by no means the first record for India, even if it be the first for Bombay. The earliest publication of Indian localities is in the *Cat. of Plants dist. by the Hon'ble the E. I. Coy.* (1821) where it is recorded from Nepal, S. India, Ava and Penang. Specimens from all these places were distributed from the Company's Herbarium in that year.

There are two species of the genus, and as the note referred to may induce members to look for the one there described, it seems worth while to state wherein the two differ, as in the search for one it is not impossible that both may be discovered.

Both *Psilotum* are plants with short wiry rootstocks emitting stems that are simple below but copiously dichotomously branched upwards and that have minute leaves laxly disposed throughout their length. In the axils of rudimentary leaves (bracts), rather smaller than the leaves proper, are placed, along the branches, single, free, top-shaped spore-cases slightly hollowed (umbilicate) at the apex. These spore-cases (sporangia) are three-lobed & three-celled; they split vertically down the centre of each lobe to permit the escape of the oblong, somewhat curved, one-ribbed spores.

Seventeen different forms of *Psilotum* have been named and described, but these arrange themselves into two groups and, within each group, pass into one another by all sorts of intermediate forms. One of these groups has three-cornered, the other has two-edged, branchlets; the branchlets in the second group are flattened out and have a distinct rib down the middle. In the first group the spore-cases and the leaves are in three rows corresponding to the angles, in the second group they are in two rows corresponding to the edges, of the branchlets.

Some members of the first group have the angles so indistinctly marked that the branches are practically round; some members of the second group have the branches so narrow that their two edges with the strong midrib

The Genus Psilotum <SIP., in India,

already mentioned, render them practically three-cornered. But no mistake is possible in either case as to the species to which the plant belongs, since one has three, the other only two rows of leaves and spore-cases. The following brief diagnosis will enable their easy determination :—

Plant erect or sub-erect; branches triquetrous many times strictly branched; leaves in 3 rows; ultimate branches three-cornered, sometimes almost round, about $\frac{1}{2}$ " in. dia.	$\left. \begin{array}{l} \\ \\ \end{array} \right\}$	<i>f. P. Mum Mgnetum</i> Sw.
Plant pendulous; branches flattened, less frequently and more laxly branched; leaves in 2 rows; ultimate branches flattened and with a distinct midrib, about 1" to $\frac{1}{2}$ " across.	$\left. \begin{array}{l} \\ \\ \end{array} \right\}$	<i>Psilotum complanatum</i> Sir.

The erect fastigiate habit of the first, the hanging spreading habit of the second generally sufficiently distinguish the two. *P. triquetrum* is usually 7-8 in. high, but dwarf specimens occur (1J-3 in. being the greatest height of specimens obtained by the writer on Barren Island); on the other hand, it is often 2-2½ feet high.

The general distribution of *P. triquetrum* is wider than Dr. Dalgado's note would indicate. It is found in South America, Central America, Mexico, West Indies, Florida, Africa, Madagascar, Seychelles, India, Indo-China, Laccadive Islands, Ceylon, Andamans, Malaya, North Australia, Polynesia from Fiji to Sandwich Islands. *P. complanatum* is equally widely distributed though it is the less common of the two except in Malaya and, apparently, the Seychelles.

The Indo-Malayan distribution, as testified by specimens in the Calcutta Herbarium, is given in full below:—

1. PSILOTUM TRIQUETUM SW.

INDIA : Bengal; Dacca, *Clarice I Barisal, Clarke I Central India; Pachmari, Mrs. Morris I Duthie!* Ceylon; centre of island, *Tliwaites! Walker! Thomson! Watson!* Laccadives; *Minikoi, Alcock!*

HIMALAYA : Kumaon, *Thomson!* Nepal, *Wallich!*

INDO-CHINA: Assam; Sibsagar, *Masters!* Khasia Hills, *Simons!* Burma; Taoung Doung Mts., *Wallich!* Barren Island, *Train!* Siam, *Finlayson!*

MALAYA : Peninsula; Penang, *Wallich!* Malacca, *Griffith ! Maingay!* Perak, *Kunstler! Wray!* Archipelago; Java, *King! Forbes!*

2. PSILOTUM COMPLANATUM SW.

MALAYA: Peninsula; Penang, *Wallich!* Perak, *Runstler!* Archipelago; Borneo, *Lobb!*

The plant referred to by Dr. Dalgado is therefore not very rare, but as it happens to be mentioned, the writer wishes to invite members who may be interested in the matter to look not only for *P. triquetrum*, but for the other species as well. Both are found in the Mascarene Islands to the west, and both also occur in Malaya and TOynesia to the east of India; there is therefore no good reason why both should not be found, if carefully looked for, in the Indian Peninsula as well.

The Genus Psilotum Sw., in India.

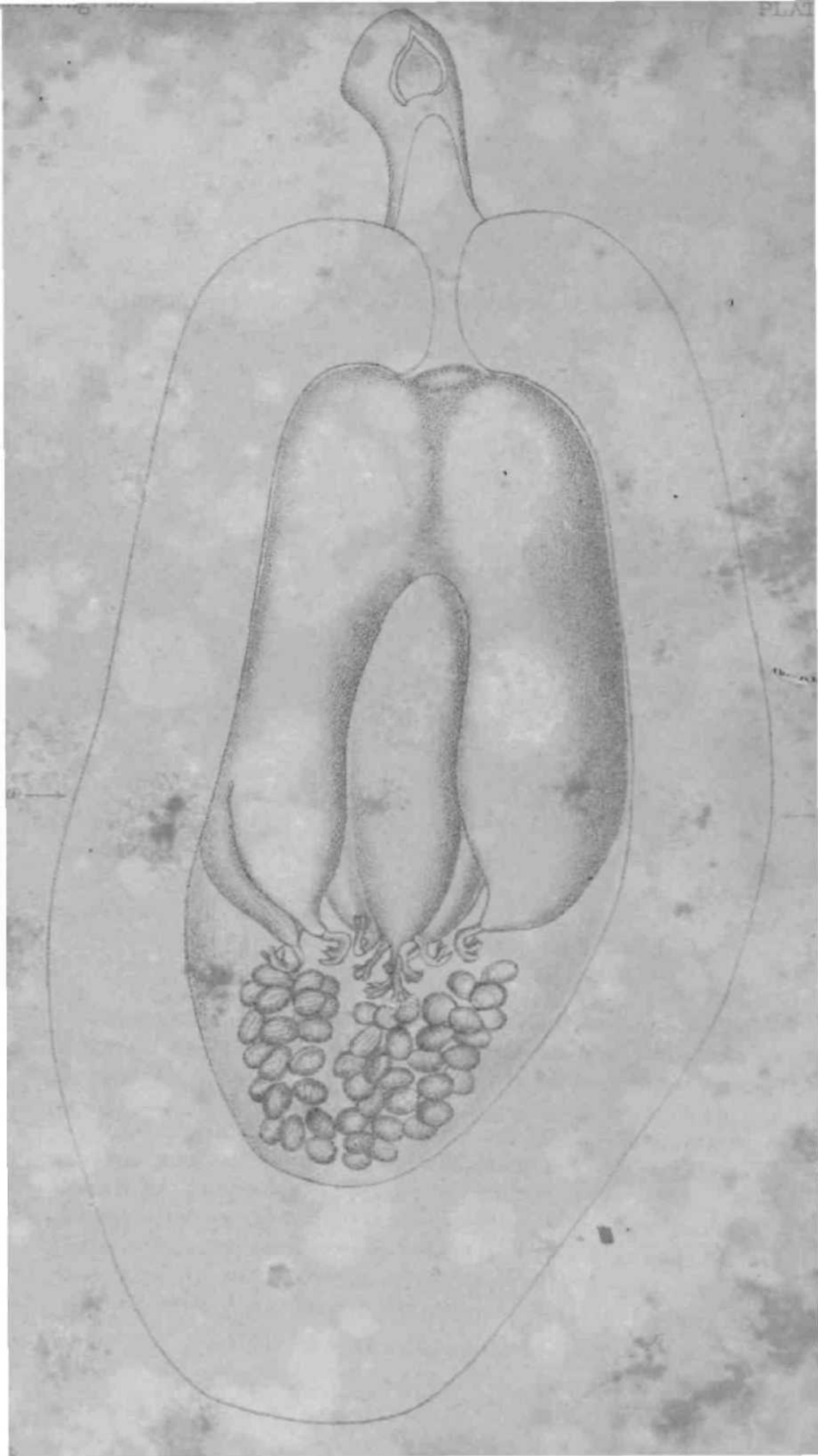
The following notes taken from tickets attached to specimens in the Calcutta Herbarium will throw some light on the habitat of the plants:—

PSILOTCM TRIQUETRUM Sw.—" Gateway of old Fort, Malacca," *Maingay*;
 " interior of crater, -Barren Island," *Prain*; " growing on itone
 " near the crater of Gunong Boddas Preanger, Java," H. O. *Forbes*;
 " growing on temples, Sibsagar, Assam," *Masters*; " growing in a
 " hollow tree where some soil had accumulated, Perak," *Kunstler*;
 " ad saxa rupesque, Mauritius," (no collector's name).

PSILOTCM COMPLANATUM Sw.—" Growing under a fern on a tree, Chan-
 " deriang river, Perak" *Kunstler*; "growing from seams of rock,
 " Chil-hua-hua, Mexico," *Pringle*.

The largest of the living plants of *P. triquetrum* in the Royal Botanic Garden were brought about 15 years ago by Dr. King, F. B. 8., c. i. E., from Java, where he found them growing among the adventitious roots of a cocoa* nut tree—exactly the situation in which Dr. Dalgado found his. But this does not necessarily imply, as Dr. Dalgado suggests, that the plant is 'parasitic:'⁹ its habit of growing at the tops of volcanoes—where there certainly is nothing living to which it could attach itself—on ruined temples and forts, and in Beams of rock, shows not only that it is not 'parasitic' but that it is not even necessarily 'saprophytic.'¹ That it prefers a situation where it can get plenty of decaying vegetable matter in which to bury its roots is no doubt true, for the specimens from rocks and ruins are stunted and dwarf as compared with those from hollow trees. But this is only in accordance with the general rule that plants grown in a 'humus/ rich in decaying vegetable matter, thrive better than those grown in thin, bare, rocky soil.

The treatment of the plants in cultivation is simple, they thrive well when grown as maiden-hair ferns are grown.



ffrm the Proceedings, Asiatic Society of Bengal for December, 1895.

A Case of Pleioiaxy of the Qyncecinm.—By D. PRAIN.

(With Plates IV and V.)

Pleiotaxy of the gyncecium, or an increase in the number of whorls of which the pistil consists) occurs so infrequently that an undoubted instance is not unworthy of record. The present example, which occurred in a *Papaya* fruit that came to table in the ordinary way as dessert, was sent to the Royal Botanic Garden by Mr* J* S. Gladstone. It is an excellent instance of the condition spoken of as "a fruit within, a fruit."¹ Of this condition there may be two explanations* An adventitious fruit may occur within the orary so as to occupy the position usually occupied by a seed. This is by no means an uncommon occurrence and, among recorded instances, is well-figured by Dr. Masters (*Veg* Tvratol.* p. 182, f. 94, 95) from an example in Wall-flower pods,

¹*Gardener's Chronicle*^ i. (1882) p. 11 and p. 601.

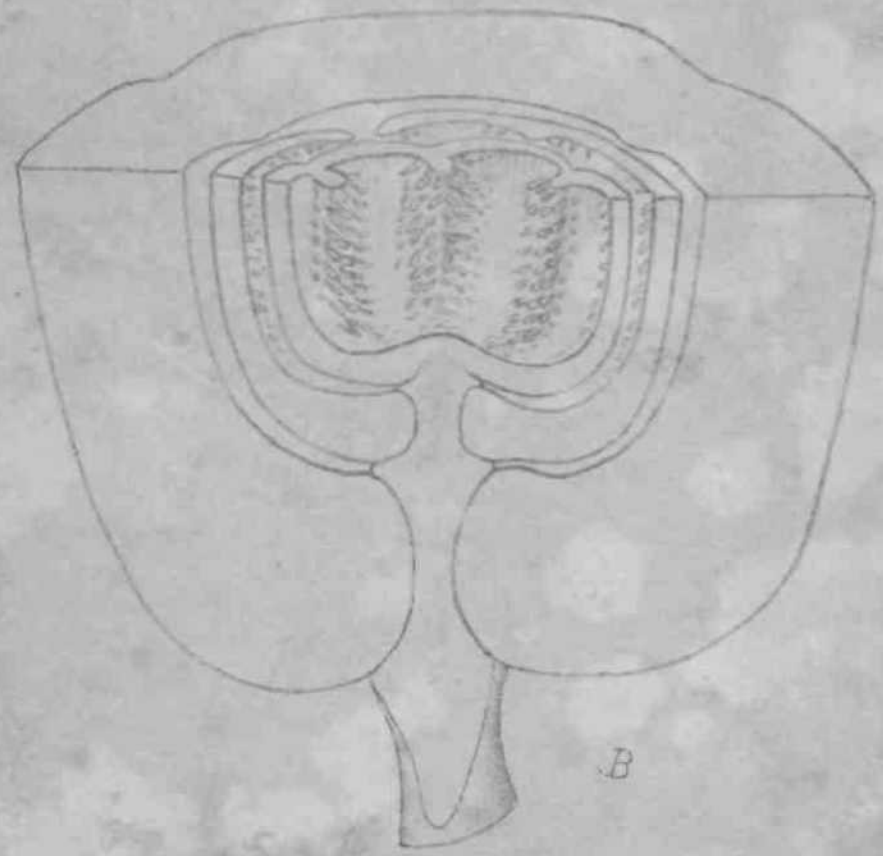
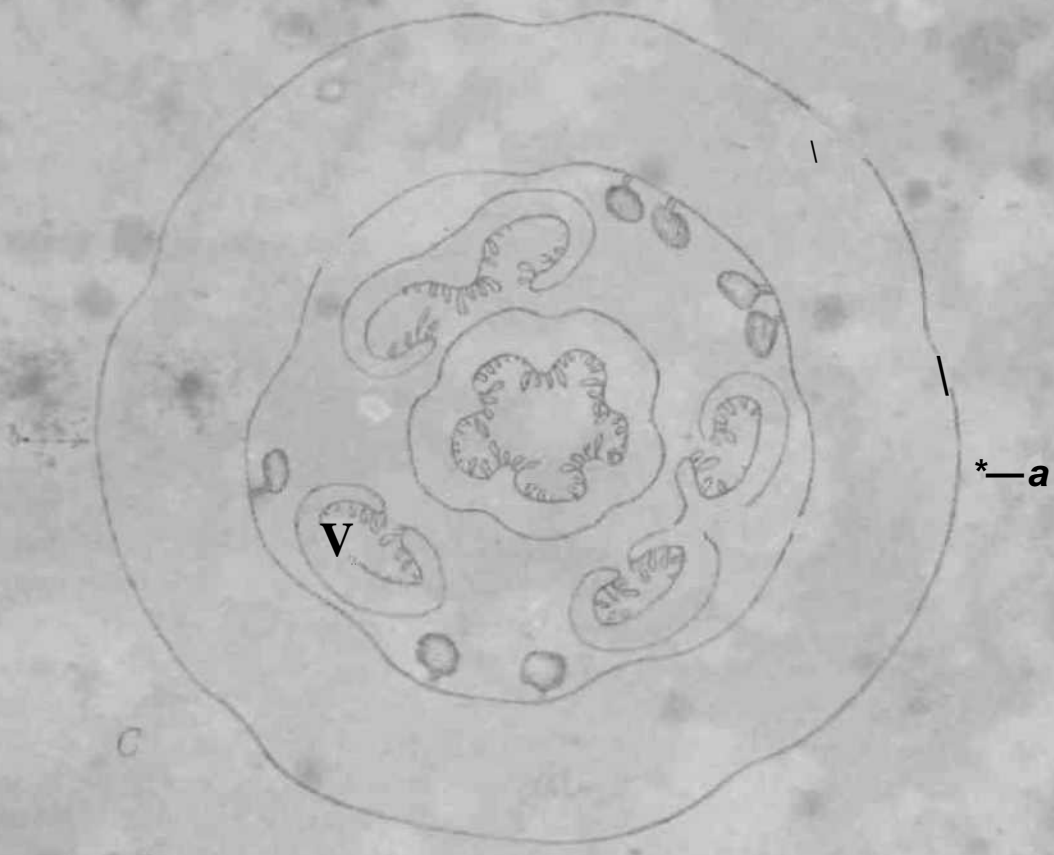
by Mr. Duthie (*Gard. Chron.* i, 1882, p. 601, f. 95) from examples in the pods of Indian Mustard and by Dr. Masters (*Veg. Teratol.* p. 183, f. 96, 97) from examples in "Grapes. Dr. King tells me that he has observed something approaching the same peculiarity in the Papaya itself, one or more of the seeds have been replaced by miniature Papayas projecting into the ovarian cavity.

Here, however, we have to deal with a different phenomenon. Inside the perfectly normal-looking fruit we find a second, about half its length, quite unconnected with the carpels of the ordinary pistil and arising from the axis of the flower within the normal ovary and therefore above the point of attachment of its parts. The edges of the carpellary leaves of this second ovary are more or less free except at the base; through the interstices we can see a third ovary proportionately smaller but rather more approaching the normal ovary in appearance and structure owing to its component carpels being united except at their tips. (PL IV, fig. A.) This third ovary we find to be as free from the second as the second is from the first; it occupies apparently the very extremity of the axis of the flower. (PL V, fig. B.)

The degree of solution of carpels in the more external of these accessory fruits is rather irregular. Two carpels are united throughout; two others are discrete only in their upper fourth. These two pairs are *inter se* discrete to within half-an-inch from their base; the solitary carpel on the other hand, is united through its lower third to each of its neighbours. The carpels of this whorl are alternate with those of the normal ovary; those of the inmost whorl are in turn alternate with the ones of the whorl just outside and are therefore opposite the normal carpels. (PL V, fig. C.) The multiplication of carpels here met with is obviously not due to *substitution* of carpels for organs of some other kind and is not easily explicable on the theory that there has been a *chorisis* of the normal carpels.

The stigmas of these extra carpels appear to be perfectly normal, but being confined within a closed cavity pollination has been impossible and the perfectly normal ovules that cover the placentas have remained undeveloped. Owing to the pressure exerted by the accessory carpels seeds are absent, excepting on the spaces opposite the gaps between these adventitious organs, from the lower two-thirds of the normal fruit. In the upper third, where there has been no pressure, perfect seeds are present as usual.

The discrete character of the outer accessory carpels will call to mind the appearance presented by the "finger-orange," in which there is, besides the separation of the ordinary ones, not infrequently an augmentation in numbers of carpels. This at times is due apparently



to stamens becoming converted into carpellary organs; not always, however, for at times there is an increase in number of carpels without any alteration of stamens or of other organs. But the presence of a complete axially situated orange within another has not, I believe, been recorded.

Though very uncommon, the condition just detailed, which is the second way in which the existence of a fruit within a fruit may be explained, is nevertheless not novel. An excellent account of a precisely parallel case has been given by Dr. Masters (*Gard. Chron.* i. 1882, p. 1J, f. 1), who records the phenomenon as occurring in *Tropidocarpnm*, an American *Grucifer*. In that instance a small ovary occupied, as in the present case, the very extremity of the flower-stem within the normal seed-vessel. And it is possible that the condition of affairs in what is known as the St. Valery apple may be of the same nature, though another explanation has been offered of the structure in this case and it must be admitted that there, as in the case of the Love-apple, where too an adventitious series of carpels is occasionally produced, the adventitious one is intimately combined with the primary series.

As showing the rarity of the condition it may be mentioned that the *Tropidocarpum* example appears to have been the first that Dr. Masters, our greatest authority on teratological questions, had met with ; if any similar condition has since been recorded, the record has escaped my attention.

In the *Gardener's Chronicle* instance only one accessory carpellary whorl is present; here there are two. Partly on this account therefore, and partly owing to the rarity of the condition, but chiefly because the phenomenon is here so obvious and the abnormal organs are so tangible—the accessory ovary in this *Papaya* measures three inches in length, that of *Tropidocarpum* only as many lines—it seems worth while recording this instance of pleiotaxy of the gynocium.



From the Proceedings, Asiatic Society of Bengal, for April, 1896.

Note on Double Rice.—By DR. D. PRAIN. (With PLAIE V.)

Some years ago Mr. Blechynden, then Secretary to the Agricultural Society of India, sent to the Botanical Garden specimens of a "double" rice. Of these specimens I now offer an account.

The phenomenon was found to be due merely to "proliferation" in the gynaecium, without any accompanying abnormality in the other parts of the flower.

The glumes are precisely those of the race of *Oryza sativa* known in Bengal as 'Kamal bhog,' a small-grained rice of high quality, of which I take the double rice to be a sport. The andraecium also in this sport has always been found normal.

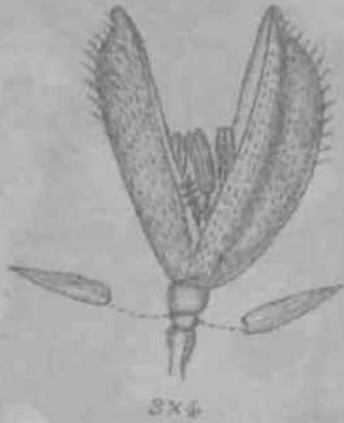
(In the gynaecium of over 150 flowers examined, not one was found with fewer than 4 ovaries (all apparently perfect), the usual number being 5; a good few flowers were found to have 6, and one or two had 7 ovaries; no flower had more than seven. When 5, 6 or 7 ovaries were present, sometimes only 3, but usually 4 or 5, appeared to be perfect®

In some hundreds of flowers of * Kamal bhog/ 'Kal magru,¹ 'Lai kalam,¹ 'Mota huiu, and 'Kala nadi'—these are the races mostly cultivated in the neighbourhood of Calcutta—which were examined at the same time, no example of duplication of the ovary was met with

(In the gynaecium of the flowers in this sport, the individual ovaries are sometimes all quite similar; oftener, however, one or more may have 3 styles instead of 2 (see fig. 8 b.), and in some of the flowers with 4 or 5 ovaries this is all the abnormality that can be detected, except that at times the two styles may be conjoined at the base in one or more of the ovaries (see fig. 8 c). But in flowers with more ovaries than 5, one or more of them may remain flaccid, their walls being without chlorophyll, and the embryo remaining undeveloped; this may happen even in cases where the style seems to be perfect. In other cases, only one style and stigma may be developed (see fig. 8 d); sometimes also the styles and stigmas may be imperfect (see fig. 8 e) and very abortive ovaries may even be organically united laterally to adjacent ones (see also fig. 8 c). In cases where the stigmas are imperfect, there is apparently never any formation of chlorophyll in the



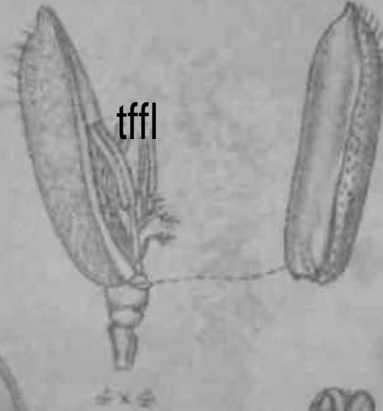
1 ad nat.



3x4



2x4

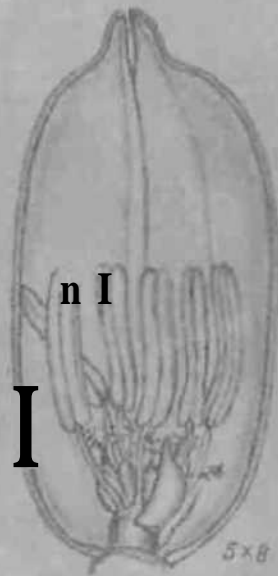


tffl

4x4



75x32



n I

I

5x8



6x16



7a x 16



8a x 16



8b x 16



8c x 16



8e x 16



8e x 16



12x4



15x4



9x4



10x4



11x4



12x4



13x4

J 1

D. Frazer del.

"DOUBLE" RICE.

A. C. Mukerjee lith.

ovarian walls/). It happens that all the figures numbered 8 *a—e* are drawn from ovaries that were contained in the same flower.

After the stamens wither, it is most usual to find that only 2 ovaries continue to develop (see fig. 9), and then not infrequently one of these fails to grow as fast as the other (see fig. 10); but very often both grow equally (see fig. 11), and the result is the *double rice.' In this case the inner faces of both the grains are flat with a whitish vertical central band (see fig. 12), and on section, the *embryo of each* is found at the outer, or *glumal*, aspect of the base of the grain.

C In a few cases three grains are developed, and then instead of having fat faces (see fig 14), they meet in the centre at the white line already mentioned (see fig. 15), this line being at the apex of an obtuse angle; the embryo is in each case at the outside, as before.

The accompanying Plate shows all the peculiarities noticeable in the flowers of this sport. The sport comes true to seed.

Explanation of the Plate.

PLATE V. "Double" Rice.

1. Spicule of "Double Rice" (*Oryzasativa*L., race 'Kamal bhog'¹—sport.)
cat. size.
2. Single flower, * 4.
3. Single flower, lower glumes removed, x 4.
4. Single flower, outer upper glume removed, x 4.
6. Floral whorls, x 8.
6. Lodicule, x 16.
- 7a. Anther, x 16. 7b. Style and stigma, x 32.
8. Five ovaries from same individual flower, which had seven ovaries, X 16.
 - a. two-styled perfect ovary.
 - b. three-styled perfect ovary.
 - c. two-styled perfect ovary, styles cohering at base.
 - d. pale flaccid ovary with only one style and stigma.
 - e. flaccid imperfect ovary with cohering styles and imperfect stigmas,
and with an abortive ovary adherent to it laterally.
9. Fertilized flower: two ovaries developing, growth of the others arrested, x 4.
10. Another flower: one ovary so developed as to fill the glumes; a second that
has been fertilized arrested in its growth at stage reached in flower
of fig. 9, x 4.
11. Another flower: two ovaries fully developed, x 4.
12. Inner face of one of the young grains shown in fig. 11, x 4.
13. Vertical section of flower in stage reached in fig. 11, showing embryos at
outer aspect of base in both, x 4.—In a normal rice grain the embryo
is at the base of the *lodicular* side, *i e.*, on the side averse from the
inner fertile and towards the outer empty upper glume.
14. Transverse section of flower in stage shown in fig. 11, indicating position
of embryos, x 4.
15. Transverse section of flower in which three ovaries have developed, x 4.

From the Journal, Asiatic Society Bengal, Vul LXV, Part II, No. 2,
1896.

On Croftia, a new Indo-Chinese genus of Scitamineae.—

By GEORGE KING and D. PRAIN.

[Reed. 31st May, Bead 3rd Jane.]

With Plate IX.

While engaged in sorting into the Calcutta Herbarium the material of the natural order *Scitamineae* received since 1892 (the date when the account of the family published in vol. vi. of the *Flora of British India* was completed) the writers met with a form that appears to differ generically from any hitherto described.

A member of the tribe *Zingibereae*, this plant by the form and arrangement of its flowers recalls the genus *Globba*, by its habit and its fruit the genus *Cautleya*. In reality, however, it is equally remote from both; its 3-locular ovary forbids more than a passing comparison with *Globba*; the absence of a lip makes its association with *Gautleya* impossible.

Its nearest natural ally appears to be the genus *Rhynchanthus*, alongside of which it must be placed. This genus* is remarkable among *Euzingibereae* in possessing small erect corolla-lobes, a lip that is reduced to a mere tooth, and a most curious petaloid filament bearing an anther with no appendage; it is at the same time devoid—though this is a less unusual character—of any trace of lateral staminodes. *Rhynchanthus* has been compared by its author with the genus *Burbidgea*† which differs in having broad corolla lobes, a distinct lip, a stamen with short filament and an anther with a long appendage; here again there is no trace of lateral staminodes.

The present plant resembles *Rhynchanthus* in possessing small erect corolla-lobes and an inappendiculate anther; it agrees further in

* RHYNCHANTHUS Hook. fil. Bot. Mag. t. 6861 (1886J; Engler, Natürlich. Pflanzenfam. ii. part 6. p. 23 (1889)} Baker in Hook. fil. Flor. Brit. Ind. vi. 257 (1892). One species; *R. longiflorus* Hook. f. loc. cit., obtained in Upper Banna by Dr. J. Anderson, and by the Collectors of Hort. Low.

† BUBBIDGEA Hook. fil. Bot. Mag. t. 6103 (1879); Engler, Natürlich. Pflanzenfam. ii. part 6. p. 22 (1889). One species; *B. nitida* Hook. f. loc. cit., obtained by Mr. P. W. Burbidge in North-West Borneo.

having no lip—that organ not being represented even by a tooth. But its filament is not petaloid and there are present two distinct petaloid lateral staminodes resembling a good deal those of a *Globba* or of a *Mantisia*; the corolla tube, moreover, which in *Rhynchanthus* is funnel-shaped above the middle, is in the present plant very narrowly tubular from base to limb, as in *Globba*; the stamens also are elongated and filiform in place of being short and oblong. While then *Burbidgea* deviates from *Rhynchanthus* in having a lip, the present plant differs equally in having lateral staminodes. And though it comes nearer to *Rhynchanthus* both as regards structure and as regards habitat than *Burbidgea* does, it seems to the writers to differ sufficiently in essentials to deserve generic rank apart from *Rhynchanthus*,

The necessary diagnosis and description are appended. The genus has been named in honour of Sir Alfred Croft, K.C.I.E., lately President of the Society, whose warm sympathy with every branch of Natural Science and of Literature is so well known to us all.

NAT. ORD. SCITAMINEAE.

Trib. Zingiberese.

CROFIA King & Prain; *gen. nov.* *Galyx* spathaceo-tubulosus, antice parum fissus, postice oblique breviter 3-dentatus. *Corollae* tubus elongatus prorsus angustatus, lobi breves 3, ovato-lanceolati acuti, erecti, postico ceteris paullo majore. *Staminodia* lateralia falcata subpetaloidea prope basin filamenti opposita erecta dimidiumque filamenti inferius arete imbricatim amplectentia; labellum plane obsoletum. *Filamentum* elongatum ad styli receptionem canaliculatum; antherae loculi 2, parum distantes, connectivo ultra loculos haud producto. *Ovarium* 3-loculare, placentis axilibus; stylus filiformis in canali filamenti receptus; stigma ultra loculos parvum apice fimbriatum; stylodia filiformia. *Fructus* ovatus pericarpio demum membranaceo; semina subglobosa arillo cupulari parvo tenui margine dentato basin tantum seminis amplectente; embryo centrali, lineari, recto.

Rhizoma e fibris carnosiss fasciculatis. *Folia* ovato-lanceolata vel lanceolata basi cordata, vaginis longis laxis. *Inflorescentia* terminalis, spicata, subsecunda. *Flores* singuli bracteâ spathaceâ, bracteolis 2 inaequalibus, sessiles, lutei.

CROFIA SPECTABILIS King & Prain. A herb with thickly fascicled root-fibres, rhizome very small. *Stem* 8-10 in. high, leafy. *Leaves* ovate-lanceolate or lanceolate, base cordate, apex acute or acuminate, with lax sheaths 5-6 in. long; blades 3-5 in. long, 1.5 in. wide, thin glabrous green on both surfaces, rather paler beneath. *Spikes* 3 in. long, subsecund, 8-12-fl. *Bracts* thin 7.5-9 in. long, ovate-


lanceolate; bracteoles '3 in. long linear. *Calyx* '25 in. pale yellow with red spots. *Corolla* with yellow tube '65 in. long, very slender throughout, hirsute externally; lobes '3 in. long '15 in. wide ovate-lanceolate acute, glabrous on both surfaces. *Filament* *75 in. long; lateral staminodes '4 in. long, glabrous on both surfaces, falcate, erect, closely overlapping each other and the somewhat produced margins of the lower half of the filament so as to form a subgibbous tube ; the channel along the filament slightly pubescent with scattered hairs. *Ovary* pubescent externally, crowned with a style 2 in. long and with 2 filiform stylodes '35 in. long. *Fruit* hirsute, '35 in. long, '25 in. across. *Seeds* '12 in. long with a cupular hyaline basal arillus.

UPPER BURMA: Shan Hills,-at Taungyi. *Bi* King's Collectors!

Flowers most resembling those of a *GUhha* both in appearance and in arrangement ; there is here, however, no labellum, while the lateral staminodes and the petals, in place of being patent, are erect; the lateral staminodes moreover are here closely imbricately opposed to the lower half of the slender filament which they embrace anteriorly, and to which consequently they impart some degree of support. In habit and in fruit this plant most resembles a *Cautleya*, but its floral structure removes it as far from the *Hedychieae* as its ovarian structure removes it from the *Mantisieae*. Its nearest ally is *Rhynchanthus*, one of the *Euzingibereae*, of which it has much the bracts and calyx and quite the corolla. *Rhynchanthus*, however, differs in having a petaloid filament without lateral staminodes; a stigma with truncate entire, not fimbriate margin, and short oblong, not elongated filiform stylodia.

[EXPLANATION OF PLATE IX.

CROFTIA REPECTABILIS King & Prain.

1. Flower.
2. Calyx, laid open.
3. Corolla tube, stamen and staminodes, the corolla-lobes removed.
4. Upper lobe of corolla.
5. Lateral corolla-lobes.
6. Stamen with staminodes, the latter slightly deflected.
7. Ovary with style and stigma, and stylodia.
8. Fruit, with marcescent calyx and corolla.
9. Capsule, cut transversely, with withered calyx and corolla removed.
10. Seed with basal arillus.
11. Section of seed. 





V

Drawn by K. E. Dass.

CROFTIA SPECTABILIS, King & Prain.

Lith. by K. E. Dass.

1896.

A Note on Indian Wheat-Rusts.

BY D. D. CUNNINGHAM AND D. PRAIN,

During the cojld season of 1895-96, while one of us was engaged in conducting certain experimental cultures of wheat at the Government Farm, Shibpur, an opportunity was afforded of partially investigating some of the phenomena connected with "rust" in wheat. The results obtained, as will presently appear, are neither final nor, so far even as they go, complete. But if they do not clear up the difficulties that surround this subject, they seem to narrow in some degree the field of enquiry; in this respect therefore they may prove of some general interest and may perhaps to a certain extent be of use. The present note, which has been prepared in compliance with an order issued to Dr Prain by the Government of India through the Government of Bengal, contains an account of our observations.

Owing to the exigencies of routine work at the Experimental Farm and, in some instances, owing to delay in the arrival of samples, the sowings were made rather late in the season. Of 88 patches, in which as many samples were tried, 27 were sown on October 31st, 1895; 21 on November 3rd; 11 on November 13th, and the remainder on November 25th. In each case the wheat was sown in parallel drills in long narrow plots.

In one of the plots of the third sowing it was noticed for the first time on January 14th, that some of the plants had become "rust-ed"; about six plants in each of three rows in the centre of the patch were then apparently affected. Two days later the "rust" was evident in adjacent patches; within a week it had appeared in every part of the wheat-field; in less than ten days it was not possible to find a single plant entirely free from rust.

The subject of "rust" on Indian wheat is for both of us one of interest because of the attention it received from our lamented friend, the late Dr. Arthur-Barclay. So soon therefore as one of us had noticed the presence of rust in this wheat-field and the other had ascertained that its structural and metric characters seemed to be those indicative of the Indian "rust" identified by Dr. Barclay with *Puccinia rubigo-vera* (Journal of Botany, vol, 30, p. 46, 1892), it became our object, if possible, to ascertain the source of the blight.

Attention was directed to the onset of the attack by the appearance of the affected plants. The leaves that form a tuft close to the soil and surround the bases of the culms seemed within 24 hours to have become suddenly wilted and yellow, the soil in a circular patch round the base of the plant having at the same time become of a rusty-red colour. Close examination of the plants showed that the blades of those yellow and suddenly-wilted leaves were completely inrolled from the margins; on their being flattened out it was seen that the upper surface of the blade was closely covered by an eruption of small circular orange-red pustules; the rusty hue imparted to the soil in the immediate neighbourhood of the plant was found to be due to the shedding of uredospores from these pustules in quantities sufficient to form a thick almost continuous surface-coating. The lower culm-leaves were still green; their upper surface was, however, covered with a crop of uredosporic pustules, and they showed that the wilting process had commenced because the edges of the leaf-blades were already slightly inrolled. The higher culm-leaves were in much the condition of those below, except that the pustules were more sparsely scattered and the edge* of the leaf-blades were not yet at all inrolled.

The limitation of the uredosporic pustules of this rust to the upper surface of the leaf-blades- observed in the case of the plants first attacked was found in the course of subsequent numerous and prolonged examinations to be an almost unbroken rule. It was not at all common, though instances did occur, to find a pustule that occupied the whole thickness of the leaf, and that burst through the epidermis of both its surfaces. But to find a pustule breaking through the lower surface only was an extremely rare occurrence. In keeping with this observation also is the fact that it seems very rare with this particular "rust," and then only in very badly affected plants, to find uredosporic pustules on the outside of the leaf-sheath. Instances of this were, however, met with both at Shibpur and elsewhere, and in one or two instances pustules even appeared on and burst through the epidermis of the stem itself. Not a single instance of the occurrence of uredospores on the pales or glumes or within the flower was met with in the case of this rust. But perhaps its most noteworthy feature, so far at least as this particular outbreak at Shibpur is concerned, was the entire absence of teleutospores. In spite of prolonged and repeated systematic search for these, during the time the wheat was in the ground, they were never met with.

The samples of wheat sown at Shibpur included examples of all the "races" or "strains" of wheat usually cultivated in the province. These races are not particularly numerous, four or five being probably the limit so far as Bengal is concerned. The majority of the samples, however, belonged to four "races"; (1) a wheat with broad leaves and soft, starchy, white grain; (2) one with broad leaves and hard, glutinous, grey grain; (3) one with narrow leaves and soft, starchy, pale-red grain; (4) one with narrow leaves and hard, glutinous, darkish-red grain. The samples were not sown in any particular order as regards place of origin or as regards race. But while every patch became more or less rusted, the blight was observed to affect more seriously the soft starchy wheats, whether white or red, than it did the hard glutinous ones. A rather curious exception to this rule was noted in the case of one patch, the wheat in which, though soft, starchy and white as to its grain, had narrow leaves like a red wheat. But there is apparently no real connection between breadth of leaf-blade and power of resisting "rust," for all save one of the "soft-red" wheats had narrow blades and almost all were badly rusted as compared with the "hard-red" wheats. The exceptions were in every case samples that ripened early, and it was apparently in agreement with those samples in this respect, and not its similarity as regards narrowness of leaf that helped to protect the "white" sample already mentioned. So far as our observations at Shibpur go, they show that there is not, at all events in Bengal, any race of wheat that is immune against this particular "rust."

The samples of wheat sown were of the usual Indian character—carelessly collected and much mixed with species of pulses and of other cereals. As a consequence when the crop appeared, numerous plants of bajra were to be found scattered throughout the field. Our attention was at once attracted to the fact that this "rust" apparently does not affect barley. As the point is one of some importance from its bearing on the assumed identity of this Indian "rust" with the *Puccinia rubigo-vera* of Europe, a close and systematic drill to drill inspection of the whole field was instituted in connection with the search for teleutospores. In no single instance was a barley-plant at Shibpur, at any period of the season, affected by this "rust."

In most instances the mode of attack was exactly as in the plot first affected. A whole line of wheat-plants that on a given morning appeared still exempt from rust, showed after a two-days' interval the crown of leaves at their bases wilted and rusted from end to end of the drill; the ground between the plants of that drill, at times

even the space between adjacent drills, became at the same time of a uniform rusty-red colour from the layer of shed uredospores that coated it.

In some instances, however, and this was more particularly the case with the glutinous wheats, the blight seemed to affect the higher culm-leaves either before or at the same time as it appeared on the lower stem-leaves and on the tuft of leaves at the base. The early portion of the period—latter half of January and first half of February—to which our observations at Shibpur refer, was marked by those morning river fogs characteristic of the season in the Gangetic delta. On such a morning the drops of water that studded the upper surface of the leaf-blades, both of wheat and barley, had a tinge of orange imparted to them by reason of the number of uredospores held in suspension within them. The slight breeze that, as a rule, accompanies the "lifting" of such a river-fog is thus clearly sufficient to carry these spores from one plant to another, while the moisture deposited on the leaves during the fog provides a means of arresting the spores. Whether the uredospores thus arrested in these dew drops actually did affect the wheat or not, it is certain that, if they were capable of affecting either the wheat or the barley, ample opportunity was afforded them of so doing.

During the first careful conjoint survey that was made by us of this wheat-field, it was found that *Launea asplenifolia* DC.,—* common weed in Bengal, where it bears the name *tikchana*, and locally abundant about Shibpur—carried on the upper surface of its leaves in great quantities the uredospores of a *Puccinia* which seemed as if it might possibly be the one present on the wheat. In another part of the field it was found that malformed shoots of the same *Launea* bore what were apparently the aecidial fructifications of the same blight. Presently too it was discovered that the under-surface of the leaves of this *Launea* carried, in some cases, the teleutospores of obviously the same *Puccinia*.

Minute examination having shown that it is not possible by structural or metric characters to differentiate the uredospores of the *Puccinia* present on the wheat from those of the *Puccinia* present on *Launea asplenifolia*, and having thus rendered it, under the circumstances, possible that the two may be specifically identical, it became necessary to undertake experimental cultures in order to confirm or to disprove their identity. The lateness of the sowings and consequent lateness, of appearance of the rust on the wheat at Shibpur and of the discovery of this *Puccinia* on *Launea asplenifolia*

rendered it impossible to carry the necessary experiments, which were initiated by one of us, to completion. As much, however, was done as it was possible, during what remained of the cold season, to do. In the meantime it was essential also to ascertain with some approach to accuracy whether the phytogeographical area occupied by this *Launea* in any way coincides with that in which wheat is grown in India. And as the evidence to be derived from specimens of the plant preserved in the Calcutta Herbarium was not conclusive, one of us was ordered by the Director of the Botanical Survey to visit certain representative wheat-growing districts and to ascertain, on the spot, the conditions there as regards the wheat, the rust, and the *Launea*. As some of the results of this investigation tended to increase rather than to diminish the difficulties that beset the whole problem, it appears better to give an account of these results *before* describing the culture experiments, although as a matter of fact the two investigations were being conducted simultaneously.

Launea asplenifolia DC, the species that was the object of this special search, is a member of the natural order *Compositae*, tribe *Cichoriaceae* § *Lacticeae*, with an extremely slender and brittle perennial rootstock of great length as compared with the size of the plant; this rootstock can be followed almost vertically downwards to a depth of from 2 feet to 30 inches, without any sensible diminution in thickness, but we have* never been able to satisfy ourselves that the whole rhizome has been obtained; on being broken the stock exudes a pure-white latex, as do the leaves and stems. Towards the top the rootstock usually divides into several heads, each head being crowned with a rosette tuft of lyrate-pinnatifid leaves 3-6 inches long. These leaves lie close to the ground in plants that grow in the open field exposed to full sunshine. When, however, the plant is growing in grassy places or amongst thick standing grain some of the internodes of the crown become, as a rule, more or less elongated; giving rise variously to a rosette arrangement at the base followed by a slender stem with scattered leaves above this rosette; to a stem with the leaves scattered throughout; or to two or more irregular rosettes separated by distinct intervals. When growing in grain or amongst grass the leaves are delicate and thinly membranous during the cold-weather months. When growing in the open, however, the leaves are much thicker and firmer, sometimes having an almost fleshy consistence, and are, as a rule, paler green in colour. This last feature, however, is not at all universal; at times plants growing exposed to the full effects of sun and wind have a dark, purplish-red tinge imparted to the leaves, especially on the under-surface. The

plant comes into flower in February in Bengal, Behar, Central India, and Rajputana. In Oudh and the Punjab it is about a month later of flowering. It fruits in Bengal about the middle of March. For a description of its yellow flowers and its fruits, on which its identity depends, but which, its identity being established, do not interest us in this connection, reference may be made to systematic treatises. The inflorescences, however, on which these flowers and fruits are borne consist of branches that arise in the axils of from one to five* of the leaves, nearest the centre of the crown. The corresponding buds in the axils of those leaves that do not subtend inflorescences remain as small bodies covered with rather longish white hairs. By the middle or end of the hot weather, as a rule, all trace of the crown and its leaves has disappeared*; these rhizomes that in May and June are still crowned with leaves have their leaves, even when the plant* is growing in shady grassy spots, thick and fleshy as in the case of plants growing in the open sun in the cold weather.

In diseased plants the uredospores appear in rusty-red pustules that are almost always confined to the upper surface of the leaves; this is not, however, universal, for sometimes they occur on the lower surface of the leaves; occasionally they are to be found, though this is very rare, in patches that burst through the epidermis of the rachis and branches of the inflorescence. These uredosporic pustules exhibit essentially the characters exhibited by the corresponding pustules on the leaves of wheat, but as a rule they are of larger size.

The teleutospores occur perhaps most frequently on the under-surface of the leaves; it is, however, much more usual to find teleutospores on the upper surface than to find uredospores beneath. And it is not at all essential that the two be present together; in certain cases indeed it was impossible to find teleutospores on the *Launea* and *vice versa*. The presence of a teleutosporic patch is usually foreshadowed by pallid discoloration of a circumscribed area on the leaf,- over this spot the epidermis very soon gives way; either generally, in which case there is a large irregular black patch of exposed teleutospores; or in a central medium-sized patch with a series of small black patches arranged round the central one in 3-5 concentric rings. Not uncommonly black teleutosporic patches are to be met with along the rachis of the inflorescence; these are always much smaller than the patches on the leaves, and sometimes the epidermis above them remains intact.

The aecidial fructifications sometimes make their appearance in what, from their position with reference to the rhizome and the other

leaves, are leaves of the normal rosette. In such a case the leaf undergoes a very rapid growth in thickness and often in length and breadth, assuming an etiolated and sickly appearance and having the indentations along its margin obscured or obliterated. Occasionally also the rachis of an inflorescence is found to be thickened in this manner and to assume the characteristic etiolated appearance that indicates the condition. But much more usually neither the leaves of the rosette nor the normally produced flower-branches are at all affected; one or more of the buds already mentioned as remaining undeveloped in the axils of the outer leaves of the rosette suddenly develop into diseased shoots, occasionally bearing malformed flowers, but much more usually having only malformed leaves. And sometimes it is found that in cases where a rhizome has several heads the others may be quite normal or at most bear only uredospores or teliospores or both, while one head is entirely malformed from the point where it rises from the ground, all its leaves and shoots being converted into ©cidia-carrying organs.

Whatever the precise morphological origin of the part may be, its consistence is similar and its history is identical. A shoot of the axillary type may by the fourth day of its special growth have become 6 inches long; whatever size it may attain it does not after the fourth day appreciably increase in size. On the third day the etiolated surface shows the presence of small papillae scattered fairly uniformly over it, these by the fifth day appear as an eruption of round miliary bodies of a fine purple colour which presently open at their tips and become converted into small cups filled with pale lemon-yellow ©cidiospores. These ©cidiospores could be seen occasionally dispersed by puffs of wind; unlike the uredospores they did not mix with water.

Sometimes the malformed shoots with ©cidial fructifications remained, after the dispersal of the ©cidiospores, as shrivelled very fragile structures. More usually, however, within three or four days of the ripening of the ©cidia the whole shoot became soft, black and putrescent, sinking to the ground and rapidly "damping off;" the general health of the plant meanwhile remained apparently unaffected.

At Mozufferpur, selected as a representative locality for North Behar, which was visited on February 21st, the state of affairs as regards both wheat and *Launea* was very similar to that prevailing at Shibpur. The wheat was not however so badly affected by rust as in Lower Bengal; every plant was not affected and none were very severely attacked. The "rust" was here found in every case to be

confined to the upper surface of the leaf-blade. *Zaun** *ayUnifolk* was very common, and specimen were obtained in field,, in a patch of village-jungle, on the race-course, by the side of a hL-road In S 0 . litYit WM 7 ^ by te PwdTM ^ at £ t "

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Mogul Serai, North-Western Provinces, on 23rd no unequivocal example of wheat affected Barclay's *rubigo-vera* was met with. Nor in the barley-field

examined were any plants unequivocally affected by Dr. Barclay's *Puccinia graminis* met with, though several good examples of the pale rust mentioned as occurring at Mozufferpur were encountered. Among the wheat plants, however, two were obtained that were unequivocally affected by the Indian rust supposed to be *Puccinia graminis*, showing in long oval pustules on the underside of the leaf. *Launea asplenifolia* was again found to be very local though quite plentiful when it occurs. Most of the plants were quite healthy; one however was manifestly affected on the upper surface of its leaves with uredospores exactly like those at Shibpur and Mozufferpur; many had teleutospores; like the Shibpur plants, usually only on the under surface, but occasionally on the upper surface as well; no aecidial fructification was met with. The *Launea* is here known as *gobi*; the rust as *gerhwi*. The name *titlia*, used at Mozufferpur for *Launea*, is here applied to a spurge, *Euphorbia dracunculoides*.

At Allahabad, which was next visited, on the afternoon of 23rd February it was found that wheat was little grown in and about the station; patches in a few compounds and along a narrow strip on the banks of the Jumna below the level reached by the river in the rains, being the only places available for search. The wheat and also the barley north of the Jumna was all quite healthy. *Launea asplenifolia* is not uncommon in gardens in the station; it was in every case quite healthy. It is here associated with another species, *Launea nudicaulis*, very like it in habit and in general appearance, but with much thicker and rather larger leaves finely serrate along their margins with minute white cartilaginous teeth, with rather larger flowers and with an ochre-coloured instead of a pure-white latex. This species also was perfectly healthy. On 24th February the area across the Jumna was examined. Here wheat was found to be this season entirely confined to the strip along the river bank mentioned above. It appeared very free from rust; only one small patch, near the upper limit of the belt, was found where about 20 plants were affected by the so-called "*Puccinia rubigo-vera*;" only uredospores were present. Associated with this patch was a single plant very considerably affected by the so-called "*Puccinia graminis*;" a second plant was found some distance off, and close to the water's edge, carrying the same rust.

Among this wheat no *Launea* was found; so soon however as the limit reached by the river in the rains was passed, *Launea nudicaulis* was found to be present and to be common. When the level ground at the top of the scarp was attained, this species gave place to *Launea asplenifolia* which was found to be plentiful. From this

point on to Naini, where the search ended, no wheat was found, and very little barley, none of the latter being diseased. *Launea asplenifolia* was quite plentiful throughout in level fields where the slopes were gentle; on the steep sides of nullahs it was replaced by *Launea nudicaulis*. No diseased example of either species was met with. The rusts are not here differentiated; both are termed *gerhwi*: both the *Launeas* are known as *gobi*.

Jabalpur, visited on 25th February as representative of the Central Provinces, gave, like Gaya, no result. The wheat in this district was quite free from rust; the black cotton soil in which it is grown was extremely free from weeds of any kind; no *Launea* was found among the wheat. On the banks of nullahs and on the slopes of hummocks rising above the level of the black soil in the fields, also in gardens, both native and European, *Launea nudicaulis* was found, but never plentifully; no *Launea asplenifolia* was met with anywhere. The search here extended from Maharajpur on the Allahabad road (25th), to Mirganj and the Nerbadda in the opposite direction (26th February), and was everywhere equally unsuccessful. The cultivators were however thoroughly conversant with "rust"; the description given of its ravages and appearance coincided very well with the description presented at Shibpur and at Mozufferpur. The name used for it was, however, *gerhwa* not *gerhwi*; the interest of this use of the opposite sex will be apparent in dealing with the names used in Rajputana.

On 27th February it was noted that on the sides of nullahs near Dhularia Railway Station, and in the station compound at Dharain Kundi, *Launea nudicaulis* was present; no *Launea asplenifolia* was seen. At Itarsi one wheat-field was visited; no rust was found. At Chandni neither *Launea* nor wheat were found.

On 28th February, at Khandwa, no rust was found on the wheat, and neither species of *Launea* was met with. The cultivators were quite conversant with "rust" which had, they said, been prevalent some seasons ago and which they know as *gerhwa*. Their description, however, differed very markedly from that, given at Jabalpur; all who volunteered information, insisting that at the last outbreak the rust was not confined to the leaves but was marked by an eruption of black specks on the glumes and pales. No barley was met with at Khandwa.

At Neemuch, visited on 29th February as representative of Malwa, the same black cotton soil that prevailed at Jabalpur and Khandwa was met with. Here also both the wheat and the barley were found perfectly free from rust. But *Launea asplenifolia*, which was not

met with at Jabalpur or Ehandwa, was here, as in Bengal, local but very abundant where it occurred. The first field examined was full of the species, and nearly every plant was badly affected by the same *Puccinia* seen in Bengal and in North Behar. In this instance, however, no uredospores were found; teleutospores were very abundant and appeared to occur only in small spots arranged in concentric circles—a condition which occurred, but was not the most usual, in Bengal. Very few plants were quite healthy; of the diseased ones about 30 per cent, had rocidiosporic fructifications; these were here much less frequently borne on specially modified shoots than on distorted flowering branches; these branches much more frequently shrivelled up into brittle twigs than damped off.' Continuing the search on 1st March, the local occurrence of the species was well seen from the fact that no *Launea asplenifolia* was obtained till a point was reached two miles away from the previous afternoon's patch, and three more miles had to be passed till another diseased patch was met with. As on the preceding day, the search failed to yield a specimen with uredospores and no rust was found either on wheat or barley. In one field a number of plants of *Launea nudicaulis* were found; though growing alongside of badly blighted *Launea asplenifolia* none of them were diseased. *Launea nudicaulis* was also found to occur on roadsides in the station itself. The name for both *Launeas* was again *gobi*; the name for the rust was *gerhwi* as at Allahabad, not *gerhwa* as at Jabalpur and Khandwa; the cultivators, however, use as an alternative the name *rori*, though not so commonly as the other.

The discovery of *Launea asplenifolia* diseased, on black cotton soil, leads to the suspicion, when its very local occurrence is taken into consideration, that it may only have been overlooked at Jabalpur and at Khandwa. Captain Pinhey, Political Agent at Neemuch, himself an enthusiastic botanist, very kindly assisted in the search of 29th February for *Launea asplenifolia*, and on visiting Ujain ten days later most kindly searched for it there, with the result of ascertaining that at Ujain it is as plentiful, and was this year as badly diseased, as at Neemuch. It therefore certainly extends as far south as to the latitude of Jabalpur, carrying the *Puccinia* with it.

At Ajruir, on March 2nd, none of the supposed *Puccinia rubigo-vera* was found on the wheat. At a point 5 miles from Ajmir on the Jeypore road the supposed *Puccinia graminis* was found on a wheat plant; the same rust was found on a barley-plaut in a field 2 miles south of Ajmir on the Nusserabad road. No *Launea asplenifolia* was found; *Launea nudicaulis* was here more plentiful than in any of the other places visited. It is known as *gobi*, and was without any disease. The rust is here *ioxi* or *roli*.

At Jeypore, visited on March 3rd, the soil in the fields was a much irrigated, fine blown-sand, extremely free from weeds. No *Launea asplenifoUa* was to be found anywhere in the neighbourhood of the city. *Launea nudicaulis*, very rare in fields, is not uncommon on roadsides and in gardens. It was perfectly healthy, as were the wheat and the barley. On 4th March Chaudaspura, 17 miles from Jeypore on the Tonk road, was visited, Colonel Jacob having been so good as to point out that at this point the soft blown-sand gives place to a firmer soil. Here, after a considerable search during which *Launea nudicaulis* was found to be fairly common, a spot was reached in which *Launea asplenifoUa* was extremely abundant. There was very little rust on the wheat, what there was being supposed *Puccinia rubigo-vera* of Shibpur. *Launea asplenifoUa* was, however, extremely affected; most of the plants carried teleutospores only; some, however, had uredospores as well. *Ecidiopsis* fructifications were apparently very rare, only one being met with; the recidia were in this case borne on a malformed leaf, on a specially developed shoot. The most interesting discovery here was, however, a plant of *Launea nudicaulis*, the species that in every other locality had been found to be healthy, with teleutospore fructifications on its leaves. The two *Launeas* are known indifferently as *gobi*, the "rust" on wheat is known as *rori* or *row*; name *rola* or *rola* was also known, but it was found impossible either to substantiate or to refute the opinion mentioned by Dr. Barclay (Journal of Botany, vol. 30, p. 47) as prevailing in quarters, that the feminine form *roli* is used for the supposed *Puccinia graminis*, the male form *rola* for the supposed *Puccinia rubigo-vera*. It is certain that some of the cultivators use the words indiscriminately and declare that both mean the same thing. Other, however, insisted that they were different. Fortunately for them, though perhaps unfortunately for the present enquiry, "rust" on wheat spot was hardly to be obtained. The little there was chanced to be the supposed *Puccinia rubigo-vera* which, according to the information obtained by Dr. Barclay, should have been *rola*; the inhabitants of the neighbourhood and the owner of the field insist that it was *roli*.

At Rewari, March 5th, very little wheat but much barley found; neither at all diseased. Here *Launea nudicaulis* is common everywhere, and *Launea asplenifoUa* as elsewhere is but abundant where it occurs; neither *Launea* was at all diseased. From the cultivators it was ascertained that "rust" here is known under the name *rori*, but the word is not much used; the term employed is *khungi*; the *Launeas* appeared to have no name.

At Sirsa, March 6th, no rust on wheat; only one plant of *Launea nudicaulis* for which no name was obtained. "Rust" is here, the cultivators, say, known only as *khungi*.

At Ferozepur, March 6th, "rust"—here known as *khungi*—was very common in patches. Though less universal than at Mozufferpur, it was much more severe in its effects. In appearance it much resembled the supposed *Puccinia rubigo-vera* of Bengal and Behar; here, however, teleutosporic fructifications were plentiful, hardly a diseased plant being without some. The principal distinction between this "rust" at Ferozepur as compared with the rust met with at Shibpur, lay in the greater frequency with which the outside of the culms and of the leaf-sheaths were here affected by uredosporic pustules. The teleutospores here, unlike the teleutospores on the *Launea*—from which they were subsequently found to differ extremely in size and shape—were covered by unbroken epidermis. *Launea nudicaulis* was not uncommon; *L. asplenifolia* was, in patches, plentiful. • Both species were known as *pattal*, and the cultivators do not appear to distinguish between them; neither species was found to be diseased.

At Lahore, March 7th, early-sown wheat was without "rust;" later sown had a good deal of the supposed *Puccinia rubigo-vera* but without teleutospores apparently; "rust" is here *khungi*. Both the species of *Launea* were found; *pattal* is a name here used only for *Launea nudicaulis*; *Launea asplenifolia* is termed either *pattal boti* or *dodak*—the last name has reference to its milky latex; the plant usually known as *dodak* is, however, the "Sow-thistle" (*Sonchus amends*). *Launea nudicaulis* was quite healthy; *Launea asplenifolia* was apparently healthy, but a number of plants were found with nodules developed in the axils of scales towards the top of the rootstock; these nodules were found to be filled with a mycelium.

At Gujranwala, March 8th, "rust" was plentiful, sometimes as at Ferozepur with teleutospores on nearly every affected plant; in these cases the uredospores were almost as plentiful on stems and outside of leaf-sheaths as on the leaves. In other fields, just as at Shibpur and at Mozufferpur, the uredospores appeared to be confined to the upper surface of the leaves and teleutospores were then absent. The only *Launea* present was *Launea nudicaulis*, sometimes called *dodak*, sometimes *pattal*. On its being pointed out that it has *not* milky juice, an informant insisted still that it was *one* of the *dodaks*; it is therefore possible that *Launea asplenifolia* may occur but was overlooked. This is not, however, certain; here not only the Sow-thistle, but ^{also} all the spurges are termed *dodak*.

There is not any evidence at present that *Launea asplenifolia* occurs in the Punjab west of Lahore. *Launea nudicaulis* occurs at Multan where it is known as *bhatal*; in Scinde; at Rawalpindi and at Mansehra in Hazara. But *Launea asplenifolia* recurs once more in the Kurram valley where it was collected by Dr. Aitchison; considering the peculiarly local nature of its distribution everywhere else, it is possible enough that it may occur in the Western Punjab, and may only have been hitherto overlooked. It occurs, too, in Scinde; within the past month it has for the first time been reported from Dear Karachi, where it is known as *hantur*.

At Amritsar, March 9th, *Launea asplenifolia* exceedingly ^{local} was quite healthy. "Bust," here termed *khungi*, was very scarce; all of it the form of supposed *Puccinia rubigo-vera* with teleutospores. "Smut," termed *kanghari*, was extremely prevalent. *Launea asplenifolia* had no ascertainable name; *Launea nudicaulis* was not found.

At Gurdaspur, March 9th, "rust," *khungi*, was very scarce; *Launea asplenifolia* was not found; *L. nudicaulis*, termed *bhantali* was rare.

At Amballa station, March 10th, *Launea nudicaulis* was seen.

At Saharanpur, March 11th, a good deal of rust, here still termed *khungiy* in local patches; mostly perfectly typical example of the supposed *P. rubigo-vera*; one specimen was badly affected on the outer side of the leaf-sheath as well as on the leaf-blade; the "rust," in this case, was apparently quite different from any of the blights obtained elsewhere. Both *Launea asplenifolia* and *L. nudicaulis* are common; the former is, however, as usual, extremely local, the latter is general. They, like the rust, are still known by Panjabi names; *L. asplenifolia* is termed *bhantali* (feminine); *L. nudicaulis* is *bhantel* (masculine form). The spurge (*Euphorbia dracunculoides*) named *titlia* at Allahabad and Mogul Serai is here termed *dodi*. In the Herb. Saharanpur collection is a specimen of *Launea asplenifolia* collected between Jan and Pilkatra, Aligarh district, in December 1885, by Mr. J. F. Duthie, badly affected by the supposed *Puccinia rubigo-vera*; both uredospores and teleutospores occur on the leaves; the rocidial fructifications are borne on specially modified shoots as in the Shibpar and Mozufferpur examples.

On the Rohilkhand and Kumaon Railway on March 14th, *Launea asplenifolia* was found in patches growing amongst kunkur "ballast" on the permanent way at the following stations: Filibhifc, Mailani, Gola Gukurnatu, and Lakhimpnr- at all of these

places *Launea nudicaulis* was also found. Both species were healthy everywhere except at Mailani, where *Launea asplenifolia* carried in plenty telentosporic fructifications of the supposed "*Puccinia rubigo-vera*"; no uredospores and no aecidial fructifications were found. In Northern Oudh both the *Launeas* are known *togobi*; the "rust" is *gerhwi*; in one place (Oel) the name *perhwi* was also used. At Sitapur, where wheat fields were examined, no rust was found, nor was either *Launea* obtained.

On this railway on March 15th, *Launea asplenifolia* was found in the permanent way at Kamalpur, Sidhauri, Ataria and Itaunja; in no case were diseased plants met with. From Itaunja onwards to Lucknow and at Lucknow itself only *Launea nudicaulis* was seen. But on the Oudh and Rohilkhand line *Launea asplenifolia* was again obtained, though not in a diseased state, at Safdarganj between Lucknow and Ajudhya, and at Malipur between Faizabad and Jaunpur.

At Meja Road on March 16th, the wheat had all been reaped; it was, however, reported to have had no rust. *Launea nudicaulis* was common everywhere. *Launea asplenifolia* was only found near Bandhwa village, but was there extremely abundant where it occurred and was much diseased; both uredospores and teleutospores were plentiful; no aecidial fructifications, however, were found.

On revisiting the wheat at Shibpur to search again—and again successfully—for teleutospores, it was discovered (March 21st) that during the interval which had elapsed since the previous inspection (February 19th), the wheat had become affected by the supposed *Puccinia graminis*.

The initial stages of this outbreak were unfortunately not seen by us, but the condition presented by the field, when examined on March 21st, was very striking. In place of being the insignificant disease & had seemed in Upper India, attacking a plant here and there, and then only to a quite trifling extent, the blight here was found to have attacked every plant in the field that had not been completely destroyed by the other "rust." Its uredospores, arranged in long oval pustules, occurred on both surfaces of every green leaf-blade, on the outside of every leaf-sheath, along the culms themselves; on the outside of the glumes and pales and even on the awns as far as their tips. A more striking contrast to the appearance of the same field when attacked by the supposed *P. rubigo-vera* than that now presented, could hardly be conceived. To render the contrast more effective, every plant of barley—which grain had remained immune from the other "rust"—was affected in precisely the way

and to precisely the extent that the wheat plants were affected. In this case too the relative immunity of the glutinous wheats against the earlier rust was of no avail; these indeed were the more severely rusted of the two classes, precisely because they had more healthy tissue left to be attacked than had the other wheats. A glance at the field in the condition it now was recalled at once the description given of an outbreak of rust some years ago at Khandwa, though it does not necessarily follow that it was *this* blight the cultivators were endeavouring to describe.

A search was at once instituted—and was continued almost daily till it became at length necessary to reap the wheat—for some local species apparently affected by this new "rust;" unfortunately up till now this search has been unsuccessful.

On closely examining the grain, however, it did not appear that this blight had done a great deal of harm. It must indeed have done some, but as it did not apparently tend to cause the leaves to wither and wither to the extent observable with the supposed *Puccinia nigro-vera*, the amount of harm could not fail to be less in this case than with the earlier rust. In the case of those wheats with the leanest and most shrivelled grains, it was of course impossible to say that all the mischief had been done by the first blight; and however, the barley, which had remained immune from the first one, ripened grain of a very fair quality though suffering so severely, to outward appearance, from the second rust, it is only reasonable to conclude that most of the mischief done to the wheat was done by the supposed *Puccinia rubigo-vera*.

The following are the principal distinctive features which characterise the various forms of rust occurring on wheat and barley that have been described above:—

I.—THE SHIBPUR RUST ON WHEAT.

Uredospores.—Sori circular or shortly oval, universally and evenly distributed over the upper surfaces of the leaves, warm yellow, pulverulent. Spores more or less circular, with elongate pedicels, and 4 to 5 germ-pores, echinulate, brilliant yellow, $24 \times 24 \text{ fi}$.

II.—THE MOZUFFERPORE RUST ON WHEAT AND BARLEY.

Uredospores.—Sori very large, elliptical or linear, much warmer orange than those of the Shibpur rust. Spores long oval, echinulate, orange, with 3 or 4 germ-pores situated equatorially, $34 \times 17 \text{ fi}$.

Teleutospores,—Sori of the same form as the uredosporic ones, warm brown, very soon exposed. Spores with long pedicels, which are frequently considerably dilated apically, fusiform; slightly constricted, usually greatly thickened terminally, occasionally oblique-ly truncate, sometimes greatly shortened and rounded, $4.48 \times 1.47/\mu$.

III.—FERÓZEPURE RUST ON WHEAT.

Urediospores and Teleutospores presenting the features characteristic of *Puccinia rubigo-vera*,

One peculiarity presented itself in connection with what was apparently this form of rust as it occurred at Lahore, the uredosporic spores being only feebly echinulate and occurring in two distinct series. *In one the spores were relatively large, measuring $28.33 \times 25.6/\mu$, and were of a pale yellow colour, whilst in the other they were very much smaller, measuring only $17.6 \times 19.2/\mu$ and were of a brilliant orange hue. As there was an entire absence of any teleutospores, it was impossible definitely to determine whether, in this instance, the species were really *P. rubigo-vera* or not.

IV.—MOGUL SERAI RUST ON BARLEY.

Uredosporic—Sori narrow, oval or linear, of small size, arranged in elongated groups running parallel with the long axes of the leaves, very pale ochreous, late in becoming exposed.

Spores pyriform, with thick, moderately long pedicels, very pale yellow, echinulate, germ-pores very obscure, apparently only 1 or 2, $24 \times 17/\mu$.

V.—SAHARANPUR RUST ON WHEAT.

Uredosporic—Sori very large, greatly elongated. Spores more or less obovate, yellow, with from 9 to 13 germ-pores which are very conspicuous and irregularly scattered over the entire surface, measuring when mounted in Canada-balsam $23.2 \times 17/\mu$, but no doubt considerably larger when in the fresh condition.

The rust occurring on *Lyncea*, and which may possibly be the source of the Shibpur rust on wheat, presented the following characters:—

Uredosporic.—Pseudoperidia wide, shallow, deeply immersed, situated most abundantly on the lower surfaces of the leaves, but, also occurring on the upper surfaces and on the axes. Spores very low, almost circular, 20×20 to $24 \times 24 \mu$.

Sporangia scattered over both surfaces of the leaves.

Uredospores echinulate, yellow, circular or shortly elliptical, germ-pores usually 3 but sometimes 4, and rarely 5 in number, irregularly scattered over the surface, 24 x 24 or 24 x 19 ft.

Teleutospores very short-stalked, deep brown, relatively broad, often slightly curved, the terminal cell frequently obliquely truncate, 36x27/x.

In the only experiment on artificial infection of wheat which, owing to the early onset of extreme heat, it was possible to conduct, the procedure adopted was as follows:—Samples of wheat were sown in five pots, and after they had freely germinated, the young blades were sprayed with water in which the uredospores of the *LaHnea* rust had been diffused in large numbers. In four instances no signs of any infection followed, probably in consequence of the extreme aridity of the air evaporating the moisture before the spores had had time to germinate. In order to avoid this source of fallacy, in the remaining case the pot was covered by a bell-glass the interior of which had been thoroughly moistened with spray for a period of forty-eight hours after the application of the spores to the leaves, and here infection manifested itself a week later in the form of an eruption of scattered yellow sori on a considerable number of leaves. The characters of the sori and the uredospores that they contained were precisely those of the natural rust, and, had it not been for the possibility that a certain number of uredospores derived from the wheat, may have been adherent to the *Latmea* leaves which furnished the infective material, the demonstration of the genetic relation between the two diseases would have been complete.

Reviewing briefly the results of the season's observations it is apparent in the first place that several blights of the nature of European "Rust" affect wheat in India.

Of these we may most advantageously consider first the rust that was originally observed in January on the wheat at Shibpur; for convenience of reference this will be spoken of as the Shibpur Rust. The description given of its uredospores tallies so well, in spite of slight differences, with the description of the uredospores of *Puccinia rubigo-vera* given by Winter and by Plowright that, were there no other discrepancies, it might perhaps be sufficient to deal with it as only a form of that species. There is reason to believe, moreover, that this blight may form at least part of the "rust" tentatively referred to *P. rubigo-vera* by Dr. Barclay.

That it differs specifically from *P. rubigo-vera* appears to us to be, however, highly probable. The reasons for this doubt may be stated

in detail. First; in *P. rubigo-vera* the "rust" forms teleutospores on wheat; in this Shibpur Rust no teleutospores are formed on the wheat. It is true that a negative proposition is difficult to prove, and it may be objected that perhaps there were some teleutospores on the wheat which were overlooked.

This may, no doubt, be the case; we do not, however, think it probable; it must be recollected too that, wherever this particular "rust" was found, the same absence of teleutospores was experienced; and it should be remembered besides that, so far as the wheat itself was concerned, teleutospores were the main object of our search.

Again, this Shibpur Rust apparently has a different host. The fibricidal fructifications in the case of *P. rubigo-versa* are carried by a Boraginaceae; in the case of the present species they appear to be borne upon a Composite. The experimental infection of healthy wheat by the *Puccinia* on this Composite may indeed at first appear to be definite proof that this contention is sound. It must not, however, be overlooked that one very serious source of possible error exists. The composite from which the infective spores were obtained grew in a neighbourhood where there was undoubtedly rusted wheat. The conditions for the dispersal of spores were in this neighbourhood almost ideally perfect; it is therefore always possible that the spores which were obtained from the *Launea*, and which actually did infect the wheat, were not spores of the *Puccinia* that lives upon the *Launea*, but were spores from diseased wheat that had been accidentally carried to the leaves of the *Launea* and were lying there among the spores proper to itself.

To counteract this source of error specimens of *Launea*, bearing spores, were sent to Calcutta from various places in Upper India. If the same possibility of error prevailed at Mozufferpur, it certainly did not exist at Neemuch or at Jeypore. But the heat and dryness of the season unfortunately prevented any of these check-infections from being carried out; all the spores had in each case lost their vitality during the short time required for their transmission to Calcutta. It is to be hoped that, in another season, we or other workers may prove more successful.

If the suggested, and certainly possible, connection between the Shibpur Rust and the *Puccinia* on *Launea asplenifolia* be ultimately made out, the necessity for distinguishing this Shibpur Rust from *P. rubigo-vera* will have passed beyond the region of debate. For in the first place the *Launea* in this case bears uredospores, teleutospores and recidia at the same time, whereas the Boraginaceae hosts for *Puccinia rubigo-versa* carry recidial fructifications only.

This remarkable difference may possibly be held to account also for the absence, in the case of the Shibpur Rust, of teliospores from the wheat. As if this were not sufficient distinction, it is seen that, though the uredospores of the two are very similar, their teleutospores are quite different.

But even if the absence of teleutospores from the wheat be held not absolutely proven, and if the connection between the Shibpur Rust and the *Puccinia* on *Launea asplenifolia* be deemed yet a matter of doubt, we still have, as we believe, proof that the Shibpur Rust is not *P. mbigo-vera*, in the fact that the uredospores of the two rusts occur in pustules that differ markedly in form and in disposition.

The uredosporic pustules of *P. rubigo-vera* are described by Winter (*Rabenhorst, Kryptog, Flora* i. pt. i, p. 218) as elliptic to shortly-linear, whereas those of the "Shibpur Rust" are round. The pustules of *P. mbigo-vera* affect especially the leaf-sheaths and culms, the leaves, according to von Tubeuf (*Pflanzenkrankheiten*, 360), being much less affected, while they are figured by Oersted (*System der Pflanzl., Deutsch. Ausgabe*, 24s) as occurring on the glumes. In the Shibpur Rust the disposition of the uredosporic pustules is quite the reverse of that indicated by Oersted and by von Tubeuf for *P. rubigo-vera*.

Another point to which we would direct attention is the fact that against this Shibpur Rust barley is immune; whereas, according to Plowright (*Brit. Uredines and Ustilagineae*, 168), barley is one of the species affected by *P. rubigo-vera*. It must, however, be recollected that Winter (*loc. cit.* 218) only postulates the form described as *P. mbigo-vera* var. *simplex* Koernicke, as occurring on barley; in this he is followed by von Tubeuf (*loc. cit.* 360), and it is probable that this is Plowright's meaning also though he does not definitely express it; it will be necessary to allude to this point further on. In the meantime the life-history of this rust having been incompletely worked out, we refrain from proposing a new name to distinguish it.

We may next consider the rust that was first met with at Mozufferpur, but that was encountered in several other localities in Upper India and was found on the completion of the tour of inspection to be raging at Shibpur in March with all the violence displayed by the other rust in January and February.

That this, which for convenience we have termed the Mozufferpur Rust, is the blight tentatively referred by Dr. Berkeley to *P. graminis*, is undoubted. The true *P. graminis* is a species whose recidial

fructifications are borne by one or more species of Barberry. In this case, however, the structural and mechanic features differ rather more markedly from those of true *P. graminis* than those of the Shibpur Rust do from the corresponding characters of *P. rubigo-vera*. The uredospores are decidedly narrower in the Mozufferpur Rust and, in place of having but two germ-pores, have an equatorial belt of germ-pores; the teleutospores are not, however, distinguishable except in forming pustules of a warm-brown colour, instead of black as in *P. graminis*. The most distinctive feature is again in the disposition of the pustules, which exactly as was the case with the Shibpur Rust and *P. rubigo-vera*, here reverse the conditions met with in *P. graminis*. In *P. graminis* the pustules are largely developed on the leaves; in the Mozufferpur Rust the pustules are confined almost entirely to the leaf-sheaths, culms and glumes. And while it is true that no plant has yet been found to carry the aecidia of this Mozufferpur Rust, it is easier, and much more probable, to suppose that such a plant exists but has, so far, been overlooked, than to postulate that its spores are wind-borne to the wheat of the Indian plains from the Himalayas or the highlands of Central India, where alone Barberries are to be found. There is another strong reason for concluding that this Mozufferpur Rust cannot well be ordinary *P. graminis*; *P. graminis* is in Europe injurious to wheat, to rye, and especially to oats, less to barley (von Tubeuf, *Pflanzenhranh/ieiten*, 358). There were but few plants of oats present in the farm at Shibpur, none of these carried any rust. But this Mozufferpur Rust affected both wheat and barley to precisely the same extent, in exactly the same way and, apparently, with equal severity; where, is apparently only one particular form of *P. graminis* (forma *secalis*) has been found on barley (Eriksson und Henning, *Zeitschr. fur Pflanzenhranh.*, 1894, 11); this form occurs also on rye, whence the name, and on Couch-grass, but has not been found on wheat at all.

The Mozufferpur Rust, even in the very severe attack witnessed at Shibpur, did not appear to us to injure the plants to any extent at all corresponding to the amount of rust they carried; the grain whether of wheat or of barley did not seem to be greatly depreciated by its presence. It is difficult to compare this feature with the corresponding character of *P. graminis*; Plowright [*loc. cit.* 168; indicates that *P. graminis* is the more severe* of the two leading wheat-rusts in England, whereas the experience on the continent of Europe appears to have been the reverse.

More difficult to deal with than either of the preceding blights is

undoubtedly that met with for the first time at Ferozepore and met with again at Gujranwala and at Amritsar, in which there were teleutospores as well as uredospores on the wheat.

The disposition of the uredosporic pustules in this blight was much the same as in the case of the Mozufferp'ur Rust, the outside of the leaf-sheaths and the outside of the culms being much more affected than the leaf-blades. But the uredospores themselves in this case differ altogether from those of the Mozufferpur Rust, and the teleutospores, while differing as much as the uredospores do in structure, deviate still further, in that the "teleutosporic pustules do not rupture the epidermis of the leaf or stem on which they occur, as those of the Mozufferpur Rust do. On the other hand this Ferozepur Rust has uredospores extremely like—indeed not distinguishable by tangible characters from—those of the Shibpur Rust and of the *Puccinia* as *Launea asplenifolia*. Still it does not follow that this Ferozepur Rust is the same as the Shibpur Rust; indeed the presumption is quite the reverse, since in this case we have a rust with teleutospores on wheat, in the Shibpur Rust one without teleutospores on the wheat. And it is certainly not the same *Puccinia* as is found on *Launea asplenifolia* for the teleutospores of the two are totally unlike. We must therefore have in this Ferozepur Rust either a very distinct manifestation of the Shibpur Rust, and at the same time find in it a proof that the *Puccinia* on *Launea asplenifolia* is in no way connected with "rust" on wheat; on what, so far as the evidence at present available goes, is more probable, find in it a third "rust" on Indian wheat.

The structural and metric characters of the "Ferozepur Rust" agree so exactly with those credited to *P. rubigo-vera* by Oersted, Winter and Plowright, and the disposition of its pustules, except that none were found on the glumes, is so like the disposition of the pustules in *P. rubigo-vera* that we should have very little hesitation in identifying it with European species, but for the difficulty as to its fructification. No Borages have yet been discovered in India—though these have been long and diligently looked for by many competent observers—to carry any *Puccinia* whatever. And this is at best but negative evidence, it still affords, in our opinion, an excellent reason for retaining an open mind regarding the point. It should be here observed that the "rust" obtained at Lahore, though teleutospores were not found, had its pustules disposed in the same manner as those of the Ferozepur Rust and not as in the Shibpur Rust. As only the late sown wheat was rusted at Lahore, the absence of teleutospores may simply have been due to

their not having yet been formed. Still as has been noted already, the pustules present were very peculiar in containing spores of two quite different sizes.

There is unfortunately as yet no collateral evidence available regarding the relationship of this Ferozepur Rust to barley or to other grasses. And there is not as yet any means of judging whether this Ferozepur Rust, or the Shibpur Rust with similar uredospores, is the more destructive to the wheat crop.

It has been already recorded that on one plant of barley at Mozufferpur in North Behar, and again on many plants of barley at Mogul Serai in the North-Western Provinces, a rust was found, the leading features of which were that the very small lemon-yellow uredosporic pustules lay arranged in many parallel longitudinal rows on the leaf-blades. This rust was only met with on these two occasions; because it happened to be more plentiful at that place, we have termed it the Mogul Serai Rust. No teleutospores were found. The rust appeared to do no tangible harm even at Mozufferpur, where the conditions had evidently not been unfavourable to the development of at least the Shibpur Rust. It does not, however, follow that under all circumstances this need remain equally harmless, and though it has not as yet been met with on wheat, it is nevertheless a "rust" that must be reckoned with in any subsequent enquiry.

Regarding its possible identity little can be said. It certainly appears to us impossible to refer it either to the Shibpur blight or to the Mozufferpur one, still less to the Ferozepur blight. Future workers may find it advisable to compare it with a little understood European *Puccinia*, also like this one apparently confined to barley, of which the aecidial fructification and the intermediate host are equally unknown. The rust in question is one that was differentiated by Fueckel (*Symbol. Nachtr.* ii. 16) as *Puccinia Eordei* and by Rostrock (*Herb. Mycet. Oeconom.* n. 451) as *P. anomala*, but was afterwards supposed by Koernicke ("*Land- und Forstw. Zeitung*, 1865, ii. 50) to be only a variety (var. *simplex*) of *P. ruhigo-vera*. Winter agrees (*loc. cit.*) with Koernicke; Plowright (*loc. cit.*) apparently does the same. Eriksson and Henning (*loc. cit.*) have returned to Fueckel's view, and treat it as a distinct species. Von Tubeuf, with a fine impartiality, adopts both views and enumerates the rust twice. But it will be apparent from this divergence of view that even this European *Puccinia* is hardly completely understood,

Finally the very distinct rust met with only at Saharanpur and only on one plant has to be referred to. This Saharanpur Rust differed markedly from all the other specimens obtained, in the dis-

position of its pustules. In place of being circumscribed areas these consisted of linear streaks, sometimes several inches in length, along the culms and along the outside of the leaf-sheaths. Whether this rust affects the glumes cannot be said, for it was only found on one plant, and, as it happened, that plant had every head destroyed by *Ustilago*. The plant, strange to say, was apparently quite vigorous; this, coupled with the general appearance of the rusted spots, led to the belief at the moment of gathering, that it was but an extreme example of the Mozufferpur Rust in which the pustules had become confluent. But when minutely examined it was found that it has nothing whatever to do with the Mozufferpur Rust; it differs entirely as regards uredospores and has no teleutospores. The uredospores are also extremely different both from those of the Shibpur Rust and those of the Ferozepur Rust. From the latter it differs moreover in having no teleutospores at all; from both it differs in having uredospores with an unusually large number of germ-pores. Whether it be capable of affecting barley is as yet unknown. But it is however, clear that there is a fifth rust—the fourth occurring in the plains of India—the life-history of which requires further investigation before the subject of rust on wheat in India is fully understood.

Any consideration of the question of the relationship of the geographical distribution of *Laena asplenifolia* to the wheat-growing area is almost premature, in view of the fact that the connection between the *Puccinia* which this *Laena* carries and one of the rusts on wheat, has not been definitely demonstrated.

It is well known, for example, that in years when rust attacks wheat in the Central Provinces, its ravages are excessive. Yet in the Central Provinces no examples of *Laena asplenifolia* were obtained. Too much stress should not be laid upon this point for several reasons. It is, to begin with, a matter capable of experimental demonstration whether this connection exists or not. If it be proved that it does exist, the observations made during the present season need not give rise to any great difficulty. There is no reason why a rust, under suitable conditions may not, after having once started from a focus of infection in the shape of a diseased *Lawia* pass on by direct infection in a very brief period from one end of a province to another. But it does not follow because it was not found in the Central Provinces that *Laena asplenifolia* does not occur there. It is a species that, though always plentiful where it occurs, has an exceedingly "local" distribution, and it is conceivable that it may exist and yet have been overlooked. Again though

Luunea asplenifolia was not found, another species of *Launea* was ascertained to be general in the Central Provinces; this species was in Rajputana discovered to be capable of carrying at least one stage of this blight. Then it is now known that *Launea asplmifolia* occurs at Ujain, which means that, farther to the west, it occurs as far south as, and in precisely the soil it would find at, Jabalpur. And, besides, it does not follow that the blight most destructive in one place or in a given season is that most destructive elsewhere or in another season. The cultivators questioned regarding the probable cause of the "rusting" at Mozufferpur, insisted that the meteorological conditions of the past cold-season never failed to induce it. At Gaya, on the other hand, the belief was that conditions such as were experienced last cold-weather are precisely those that ensure exemption from the blight. One possible explanation of this discrepancy is doubtless that the blights which the cultivators had in their minds may be different ones. But this is certainly not the only explanation, and in no case is it quite a sufficient one. Fortunately for the cultivator, but unfortunately for our enquiry, there was practically no rust this year outside Bengal and North Behar. But even during the journey described above, it was possible this year to discover that different blights may on occasions lead to practical destruction of the wheat crop. At Maharajpur near Jabalpur a cultivator described with all the accuracy born of familiar and sad experience the wilting and inrolling of the tuft of leaves at the "base of the young wheat plant, the rusty spotting of the leaves above, the reddening of the ground and the shrivelling of the grain characteristic of the Shibpur blight* "It ate up the fields like fire" was the striking phrase with which he concluded his narrative of the last rust epidemic in Central India.

At Khandwa, on the other hand, the wheat being there also this year equally free from rust, the cultivators described the onset and progress of their last epidemic in altogether different terms, and though the force of the account was not at the time appreciated, the moment the wheat-field at Shibpur, when under the full influence of the Mozufferpur Rust, was seen, it was realized that the Khandwa account may have been as graphic and probably as accurate as the account obtained at Jabalpur, since here too was a prevalent blight with general features quite as striking as, and yet totally unlike, those of the earlier one. It did not, however, follow that what had been described at Khandwa was this particular rust. On the contrary the fact that this—the Mozufferpur Rust—does not apparently, even in bad cases, very seriously affect the health of the plant, whereas the blight described by the cultivators at Khandwa was said to have

completely ruined their crop, leads rather to the conclusion that the Khandwa rust must have been different from the Mozufferpur one; it may possibly have been the Ferozepur Rust which, as we have indicated, closely resembles true *P. rubigo-vera* if it be not actually that species. In true *P. rubigo-vera* the glumes are covered with pustules, precisely as the Khandwa cultivators described; it is true that no pustules were found on the glumes in the Punjab this season; it must, however, be recollected that rust in the Panjab was this year almost everywhere scarce and hardly anywhere severe.

Even if it be ultimately possible to definitely associate the *Puccinia* on *Launea asplenifolia* with one of the rusts on Indian wheat, and even if that rust should prove to be the most destructive of all the rusts that occur on wheat in the plains of India, it is somewhat difficult to suggest any remedial measure. There is, of course but one that could be of any real benefit—the extirpation of *Launea asplenifolia*. But it will, we think, be plain, from the account we have given of its structure and of its distribution, that this w^{ust} prove practically an impossible undertaking.

Even if *Launea asplenifolia* were eradicated, the source of that one blight would be removed; and in the meantime it is necessary to wait for verification or the reverse of the connection mentioned as possible in the case of the Shibpur blight, and for further knowledge regarding the other rusts before active measures are advocated.



A NOTE
ON
**THE BOTANY OF THE BALUCH-AFGHAN
BOUNDARY COMMISSION, 1896.**

By F. P. MAYNARD and D. PRAIN.

HAVING been directed to join, as medical officer to the party, the Baluch-Afghan Boundary Commission which was occupied from 27th January till 29th May 1896 in demarcating the frontier between Baluchistan and Afghanistan, Surgeon-Captain Maynard, I. M. S., before leaving Calcutta, obtained a supply of drying paper from the Herbarium of the Royal Botanic Garden. On Dr. Maynard's return he made over to the Herbarium the specimens collected; the species were there determined by Dr. Prain. The present note has been prepared jointly from Dr. Maynard's field notes and from the determinations effected in the Herbarium, Calcutta; it should, however, be understood, with reference to the opinions expressed as to the identity of certain species, that Dr. Prain accepts all responsibility for the identifications, and for any deductions to which these may lead. For the map that accompanies the note, on the other hand, Dr. Maynard accepts all responsibility.

From Gulistan, where the Commission left the railway, on to Shorawuk, the country resembles the district to the south-west of Quetta described by Stocks in Hooker's *Journal of Botany*, Vol. 11, pp. 303—308 (1850). A very full account of the vegetation of the neighbouring district of Quetta itself is given by Mr. Lace in the *Journal of the Linnean Society*, Vol. XXV111, pp. 288—312 (1891).

The Shorawuk plain, immediately to the north of Nushki, in Afghan territory, it is quite fertile and fairly well populated, the inhabitants occupying permanent villages. The people cultivate by irrigation, the water for the purpose being obtained from the Lora river, which ends in this plain. Wheat and barley, especially the latter, form the staple crops.

The similar plain of Nushki, to the south of Shorawuk, which ^{was} only skirted on the outward journey, but which was traversed

by the Commission on its return march, belongs to Baluchistan. The country from Nushki onwards to Robat is not absolutely barren; about Lijji-Karez, where there is a stream, and round Chageh, where there are wells, there is indeed a fair amount of vegetation. No cultivation was seen at either place though there is said to be a little cultivation round Chageh fort.

At Robat itself, which is situated near the Koh Malik-Dokhand and is about midway between Quetta and the Persian frontier there is a small stream; here the main camp of the Commission remained for two months. There is said to be some cultivation at this point, but none was seen.

There is another Robat (the name means simply "outpost") at the foot of the Koh-i-Malik Siah where the two countries meet Persia; here there is a little cultivation of wheat and barley. Between the two Robats, a distance of 270 miles, water—nearly always saline—was only obtained in seven places. The country traversed was a desert composed of alternating sand hills and gravel plains with hardly a trace of vegetation. The line of march skirted the bases of successive mountain ranges running up to 5,000 feet, as barren and desolate as the desert itself, of which they form the southern boundary. The general elevation of the line of march was about 3,000 feet.

The water-supply consisted of springs or wells situated a few miles off the line of march up gorges in these mountains,—the desert itself being waterless except for the large salt lake known as the Gaud-i-Zirreh and a smaller salt lake in the bed of the Shelag river at Godir-i-Shah. The Gaud-i-Zirreh is an overflow of the Helmund rendered salt by continued evaporation; the last flood sufficient to cause an overflow occurred in 1884, but the lake is still of considerable size.

During the first part of the Mission in February while among the mountains of the Khwaja Amran and Sarlat ranges, the cold was intense, the minimum thermometer indicating 15° Fahr. below freezing point—the soda-water carried by the Mission being frozen; snow and hail fell frequently. In April and May the heat was just as intense as the cold had previously been. The maximum shade temperature reached 115° Fahr., and the solar radiation thermometer frequently reached 205° Fahr., the highest temperature the instrument was capable of recording. Violent dust- or sand-storms occurred almost daily. The dryness of the atmosphere was great, the difference between the dry- and wet-bulb thermometers varying from 30° up to 40°.

For the last two years there had been no rain; this year in February and March rain fell, and it was owing to this fact that the Commission was able to stay so long as it did, the rain having delayed the advent of the hottest weather. Usually the fierce hot winds commence blowing from the west early in April, but this year they were only beginning when the Commission started back, in the middle of May, from the Robat where its main camp had been stationed for the two previous months. The inhabitants, where there were any, spoke of the heat with awe and said these hot winds shrivelled everything up and kept the people imprisoned in their tamarisk huts from morning till evening. The slight experience the Commission had was quite enough to make its members believe all the inhabitants said.

In consequence of the excessive heat the Mission had to march, for the greater part of the period it was away, during the night. It for this the collection obtained might have been considerably increased. While, however, it is admittedly far from complete, there is no reason to doubt that it is fairly representative of the flora of the country traversed. All the specimens come from a region lying between latitude 29° and 30° north; the longitudes of the different localities with their altitudes are given in the systematic list. The specimens obtained on a hill, 600 feet high, lying eight miles west of Gazechah, were brought in by Lieutenant Webb-Ware; the others, with one or two exceptions, collected by Surgeon-Captain Maynard.

The collection, small as it is, has proved one of very great interest; with hardly an exception, Or. Maynard's specimens belong to species previously most inadequately represented in the Calcutta Herbarium. In preparing the list the primary references given for the species are those in M. Boissier's *Flora Orientale*, the only work which deals systematically with the vegetation of the area; those in the *flora of British India*, where the species happens to be included in that work, have been added for purposes of comparison.

The flora of the region is purely that of the 'Oriental' region, for of the 43 flowering plants recorded in the list, it will be seen that seventeen or nearly 40 per cent, are not accounted for in the *Flora of British India* at all and are therefore plants that presumably do not occur within British territory; of the remainder, only seven, or a little over 16 per cent., extend to the east of Scinde, Rajputana and the Western Panjab—districts that, from a phytogeographical point of view, form but a province of the 'Oriental' region.

Perhaps the most striking feature of the list is that it includes fewer than twelve species of flowering plants which are not to be

found in the list of plants from British Baluchistan, drawn up by Messrs. Lace and Hemsley in their very interesting and exhaustive sketch of the vegetation of that region in the *Journal of the Linnean Society*, Vol. XXVIII, pp. 313—321-

These species are as follows :—

Tamarix macrocarpa.
Reaumuria Stocksii.
Monsonia senegalensis.
Trachydium Kotschyi
Ferula Assa-fcetida.
Phagnalon acuminatum.
Senecio Decatsnei.
Statice macrorhabdos.
Hyoscyamus muticus.
*Mentha arvensis**
Rheum Ribes.
Gagea amblyopetala.

We might add to the list also *Rhagadiolus Hedypnois*, but for the fact that our material of the plant so identified is insufficient for absolute determination.

That so large a proportion as 28 per cent, of the species reported should differ from those obtained in the Quetta district indicates that, in spite of the general similarity of the vegetation throughout Baluchistan, there are still some marked local differences. It may be assumed, too, that the figures given are not likely to overstate the proportion, for while it is true that the present list must be very far from complete for the area to which it refers, that given by Messrs. Lace and Hemsley is probably almost exhaustive, since the formation of the collection on which it is based extended over several seasons.

And that the alteration is gradual may be gathered from the fact that at least four of the twelve species now enumerated as absent from the Quetta district were obtained by Stocks in the country immediately to the south west of Quetta.

List of the plants collected during the Baluch-Afghan Boundary Commission.

CRUCIFERÆ.

1. MALCOLMIA BUNGEI Boiss. *Fl. Orient*, i., 226.

Plain 20 miles north of Nushki, 3,000 feet; Lon, 66° E., *Maynard**

Hill 8 miles west of Gazechah, 6,000 feet; Lon. $64^{\circ}5' E.$, *Webb-Ware*.

2. MALCOLMIA STRIGOSA Boiss. *FL Orient* i, 224; *FL Brit. Ind.*, i, 146.

Shorawuk plain, among wheat, 3,000 feet; Lon, $66^{\circ} E.$, *Maynard*.

3. PHYSORHYNCHUS BRAHUICUS Hook. *FL Orient.*, i, 403; *Fl* > *Brit. Ind.*, i, 165.

Saindak, 3,000 feet; Lon. $61^{\circ}40' E.$, *Maynard*.

TAMARISCINE.E.

4. TAMARIX PALLASII Desv. *FL Orient.*, i, 773. *T. gallica* var. *Pallassi* of *FL Brit. Ind.*, i, 248.

Between Lijji-Karez and Chageh, 2,400 feet; Lon. $64^{\circ} V E.$, *Maynard*.

This is what stands, at least in part, as *T. gallica* proper in Messrs. Lace and Hemsley's list of Baluchistan plants.

5- TAMARIX MACROCARPA Bunge. *FL Orient.*, i, 779.

Sarlat range on hill-sides at junction of Shista and Lora rivers, 4,000 feet; $66^{\circ}10' E.$, *Maynard*. Gargarok, 4,500 feet; Lon. $64^{\circ}15' E.$, *Maynard*.

A shrub with bright red bark, much galled by insects. This was obtained also by Dr. Aitchison during the Afghan Delimitation Commission of 1884-85.

6. REAUMURH STOCKSII Boiss. *FL Orient.*, i, 761.

Saindak, on fossil-beds, 3,000 feet; Lon. $69^{\circ}40' E.$, *Maynard*.

Petals pinky-purple, anthers red.

GERANIACE^E.

7- MONSONIA SENEGALENSIS Guill. & Perr. *FL Orient.*, y, 898; *Fi. Brit Ind.*, i, 427.

Saindak, 3,000 feet; Lon, $61^{\circ}40' E.$ -i *Maynard*.

RUTACEiE.

⁸ - PEGANUM HARMALA Linn. *FL Orient.*, i, 917 i *Fl. Briu Ind* > i, 486.

^{Soru} >> 4,500 feet; Lon. $63^{\circ}30' E.$, *Maynard*.

A poisonous shrub which camels refuse to eat.

ANACARDIACEJE.

9. PISTACIA CABULICA Stocks. *FL Orient.*, ii; 7:

Between Goari Nullah and Bara Khan Karez; Lon. $66^{\circ} 10'$; leaves galled, *Maynard*. Gargarok, 4,500 feet; Lon. $64^{\circ} 45' E.$, *Maynard**

This tree was found by Dr. Maynard growing in clefts of limestone rock above the level of the tamarisk (*Tamarix macrocarpa*) that filled the bottom of the valley. In this place therefore the species affects a position corresponding to that affected (see Lace and Hemsley) by *Pistacia Khinjak* in the Quetta district. Dr. Maynard's tree is, however, undoubtedly *P. cabulica*, which Messrs. Lace and Hemsley treat as only a variety of *P. mutica*. Dr. Aitchison goes still further, since he will not admit that even *P. Khinjak* can be separated from *P. mutica*, and further believes that, when so united, *P. mutica*, *Khinjak* and *cabulica* only form a variety of *P. Terebinthus*. A careful examination of the material in the Calcutta Herbarium prevents the writer from adopting Aitchison's conclusion and leads him, with Stocks and Boissier, to treat *P. cabulica* as a distinct—it certainly is a very easily distinguishable—plant.

LEGUMINOS/E.

10. ASTRAGALUS SQUARROSUS Bunge. *FL Orient.*, ii, 487-Saindak, 3,000 feet; Lon. $61^{\circ} 40' E.$, *Maynard*.

The specimens exactly agree with Griffith's n. 1541 [K. Dj and with Stocks'n. 761. This species forms, at all events in part, the *A. hyrcanus* of Messrs. Lace and Hemsley's list. Though it superficially closely resembles *A. hyrcanus* it is in reality very distinct from Pallas' plant.

UMBELLIFERJE.

11. TRACHYDIUM KOTSCHYI Boiss. *FL Orient.*, ii, 929.

Near Robot, 5,000 feet; Lon. $61^{\circ} 40' E.$, *Maynard*. Near Saindak, 3,000 feet, in an almost dry stony river-bed; Lon. $61^{\circ} 40' E.$ & *Maynard*.

Flowers pale greenish-yellow, smelling exactly like parsley.

12. FERULA ASSA-FCETIDA Linn. *FL Orient.*, ii, 994.

Hills between Samuli and Robot, 5,000 feet; Lon. $63^{\circ} 50' E.$, *Maynard*.

The true Assa-fcetida or at all events one of the species from¹⁰ which Assa-fcetida is collected; seen again at Amir Chah, Lon. $62^{\circ} 35' E.$, and at Saindak, Lon. $61^{\circ} 40' E.$ The plant affects bare rocky hill-sides and in trying to dig out an entire rhizome, holes several feet deep were frequently made; an entire root-stock was, however, never obtained.

This is the plant, or at least one of the plants, that people from Kandahar yearly visit the Koh-i-Sultan to collect.

Captain McMahon, who has often watched the collection of *Assa-fcetida* in other parts of the North-Western Frontier, thus describes the process: When the heads are 2 or 3 feet high they are cut down to within one to two inches from the ground. The cut ends are then covered with a little dry earth in order, the collectors say, to keep the wind off. After twenty hours the people collect what has exuded; the stock is then cut down another eighth of an inch. Captain McMahon has not noticed whether the operations are performed at any particular hour of the day.

The milk is not allowed to dry in the sun; to obviate this the *Assa-fcetida* collectors build small stone traps, open at one side, over each plant in order to keep off the sun's rays. The juice when partly dried is mixed with some kind of earth like Fuller's earth; this is merely to increase the weight and not with any idea of improving the drug. Doubtless the precautions taken to prevent drying are mainly with a view to facilitate this subsequent adulteration.

The collection is usually carried on about June and July chiefly by Kakars—and among these by the tribe of Hari Pal, and by Babars, who travel to the likely places from Kandahar.

This year there were no signs of any arrivals up to the middle of May, when the Commission left the region. This was partly because there had been no rain during the two or three previous seasons, but partly also—so the guides informed the party—because a rumour had got abroad that a British force was expected this year, the Commission being magnified into an army corps.

On the hills round Amir Chah many of the small traps mentioned above were met with. They were not the domed structures formed of twigs and covered with clay that have been described by Aitchison (*Trans. Bot. Soc. Edin.*, xviii, ?o), but were made of stones. Small flat stones were propped against each other so as to form triangular or quadrilateral chambers, open at one end, usually the north, roofed over with another flat stone and measuring from 8 to 12 inches in height by about as much across the mouth.

COMPOSITJE.

*3- PHAGNALON ACUMINATUM Boiss. *Fl. Orient.*, iii, 222.

Wuchdara river, among rocks, 5,000 feet; Lon. 66°28' E., *Maynach* %

Mr. ^{***ace} reports *P. niviutn* from British Baluchistan, but not this species.

14. *PULICARIA GLAUDESCENS* Jaub. & Spach. *FL Orient.*, Hi, 209; *FL Brit. Ind.*, iii, 300.

Hill 8 miles west of Gazechah, 6,000 feet; Lon. 64°50' E., *Webb-Ware*.

15. *ANTHEMIS ODONTOSTEPHANA* Boiss. *FL Orient.* iii, 319; *FL Brit. Ind.*, iii, 312.

Hill 8 miles west of Gazechah 6,000 feet; Lon, 64°50' E., *Webb-Ware*.

»6. *ARTEMISIA MARITIMA* Linn. *PL Orient.*, iii, 366 ; *FL Brit.* Ind.*, iii, 323.

Spintijha, 6,000 feet, and elsewhere all over the hill-sides ; *Maynard*.

This species was met with in greatest quantity in the region between Lon. 66°50' E. and Lon. 65° E. The plant smells strongly of sage; yields a much-esteemed oil; affords excellent fuel; and is one of the best and most valuable camel-fodders.

17. *SENECIO CORONOPHOLUS* Desf. *FL Orient.*, iii, 390', & *Brit. Ind.* iii, 341.

Plain 20 miles north of Nushki, 3,000 feet; Lon. 66° E. *Maynard*.

Hill 8 miles west of Gazechah, 6,000 feet; Lon. 64°15' E., *Webb-Ware*.

18. *SENECIO DECAISNEI* DC. *FL Orient.*, iii, 386.

Hill 8 miles west of Gazechah, 6,000 feet Lon. 64° E., *Webb-Ware*.

19. *RHAGADIOLUS HEDYPTIS* Eisch. & Mey. (?) *FL Orient* iii, 723; *FL Brit. Ind.*, iii, 392.

Saindak, 3,000 feet; Lon. 61°40' E., *Maynard*.

A seedling plant without flower appears to belong to this species but the material is insufficient for definite determination.

PLUMBAGINACEAE.

20. *STATICE CABULICA* Boiss. *FL Orient.*, iv, 871; *FL Brit. Ind.*, iii, 480.

Head of Shista river, 6,500 feet; Lon. 66°25' E., *Maynard*. Sarlat range, on hill-sides at junction of Shista and Lora rivers, 4,000 feet; Lon. 66°30' E., *Maynard*.

21. *STATICE MACRORHABDOS* Boiss. *FL Orient.*, iv, 869; *FL Brit. Ind.**, iii, 480.

Sarlat range, in stream-beds at junction of Shista and Lora rivers 4,000 feet; Lon. 66°30' E., *Maynard*.

This species is apparently confined to stream-beds; it never occurs on hill-sides like *S. cabulica* and is later of flowering than that species.

APOCYNACEAE.

22. *RHAZYA SIRICTA* Dene. *FL Orient.* iv, 46; *FL Brit. Ind.* iii, 640.

Western slope of the Sarlat range, 3,500 feet; Lon. 65° 59' E.,
Capt. H. F. Walters.

A deadly poison which, however, the camels know to avoid. The Oleander [*Nerium odorum*], a member of the same natural family, was seen occasionally during the early marches, but was not collected. The Oleander is an equally deadly poison and possesses the disadvantage that camels can never be taught to avoid it, though donkeys can.

BORAGINACEAE.

23. *HELIOTROPIMUM EICHWALDI* Steud. *FL Orient.*, iv, 131; *FL Brit. Ind.*, iv, 148.

Saindak, 3,000 feet; Lon. 61° 40' E., Maynard.

SOLANACEAE.

24. *LYCIUM BARBARUM* Linn. *FL Orient.*, iv, 289; *FL Brit. Ind.*, iv, 241.

Gargarok, 4,500 feet; Lon. 64° 5' E., Maynard.

25. *HYOSCYAMUS MUTICUS* Linn. *FL Orient.*, iv, 293; *FL Brit. Ind.*, iv, 245,

Kacha; edges of streams at 3,300 feet; Lon. 61° 40' E.; "corolla lavender with claret-colored markings," Maynard.

This species was not obtained by Aitchison during the Afghan Delimitation Commission of 1884-85, nor has it been collected in Eastern Baluchistan by Lace. In the area examined by Lace, *a. reticulatus* occupies similar situations and appears to be the representative of this species.

OROBANCHACEAE.

26. *CISTANCHE TUBULOSA* Wight *Ft. Brit. Ind.*, iv, 33+
Pheliptea tubulosa Boiss. *Ft. Orient.*, iv, 500.

Between Chandan Band and Ziarat Syed Mohmund' 3,000 feet
Lon. 65° 30' E., May Hard. Desert near Gazechab, 2,500 feet, Lon.
64° 50' E., Maynard.

Only about six inches of the flowering portion of the plant appears aboveground; the underground part is 1 or 3 feet in length. The flowers are sweet-scented, the older flowers purple, the younger yellow. The plant on which it grows not ascertained. Lace finds that on the plains at Bibi this is

parasitic on *Salvadora oleoides* and that there the flowers are golden-yellow.

LABIATE.

27. MENTHA ARVENSIS Linn. *Fl. Orient.*, iv, 544; -*W. Brit. Ind.*,
 iv, 648, c 0, 17
 Lijji-Karez, 2,400 feet, along the stream; Lon. 64°50' E. >
Maynard. In gorge at Gargarok, 4,500 feet; Lon. 64°15' E. >
Maynard.

Mentha sylvestris, which might well have been expected to occur, was not once met with throughout the Mission; on the other hand, the present species apparently was never met with by Mr. Lace in Eastern Baluchistan.

28. SALVIA MACROSIPHON Boiss., var. KOTSCHYI, Boiss. *Fl. Orient.*, iv, 615.

Gargarok, 4,500 feet; Lon. 64°15' E., *Maynard*.

The specimen agrees exactly with Stocks n. 709 which is identified as above by M. Boissier himself. The same plant, it should be added, is issued by Messrs. Hemsley and Lace as identical with 5. *Sclarea* Linn; this the writer can hardly bring himself to admit.

ILLECEBRACEAE.

29. COMELES SURATIENSIS Linn. *Fl. Orient.*, i, 753 | §1* *Brit. Ind.*, iv, 712.

Saindak, on fossil mounds, 3,000 feet; Lon. 61°40' E., *Maynard*'

30. GYMNOCARPOS DECANDRUM Forsk. *G./ruticosum?* *Fl. Orient.*, i, 748.

Desert near Gazechah, 2,500 feet; Lon. 64° V E., *Maynard*.

Used as a camel fodder.

AMARANTACEAE.

31. AERUA JAVANICA JUSS. *Fl. Orient.*, iv; *Fl. Brit. Ind.*, iv, 77<

Hill 8 miles west of Gazechah, 6,000 feet; Lon. 64°0' E., *Webb-Ware*.

CHENOPODIACEAE.

32. CHENOLEA ERIOPHORA Aitch. & Hemsl. *Kochia latifolia* Fresen. *Fl. Orient.*, iv, 927.

Desert near Gazechah, 2,500 feet; Lon. 64°50', *Maynard*.

Hill 8 miles west of Gazechah, 6,000 feet; Lon. 64°50', *Webb-Ware*,
 Covered with fine wool, white on surface, beautifully tinted with lake underneath. The wool becomes greyish-brown when the plant is dried.

POLYGONACEÆ.

33- CALLIGONUM sp.=Griffith, *Journal* n. 93.

Desert near Gazechah, 2,500 feet; Lon. 64°50' E., *Maynard*.

Hill 8 miles west of Gazechah, 6,000 feet; Lon. 64°50' E., *Webb-Ware*. Amir Chah, 3,300 feet; Lon. 62°38' E., *Maynard*.

The specimens of all three gatherings belong obviously to one species. Only one gathering, however, that from Amir Chah, has flowers and none of them have fruits. All the specimens of each of the three gatherings have many of the corky nodes, with the green branchlets that spring from these nodes, galled by insects; these-galls look so remarkably like flowers that Dr. Maynard's field-note on the Gazechah desert specimens describes the plant as a bush with "rich claret-coloured velvety flowers on the branches."

The writer finds the same difficulty in dealing with the Afghan and Baluch specimens of *Calligonum* preserved in the Calcutta Herbarium that Dr. Aitchison has found in dealing with those collected by him during the Delimitation Commission of 1884-85. The only specimen that agrees absolutely with Dr. Maynard's plant is Griffith's n^o 95 (*Journal*), which was obtained by Griffith in woods at Jaghun not far from Shikarpur, nothing quite like which has been reported to Herb. Calcutta, since Griffith collected it, till now. The flowers of this plant are less than half the size of those of *C. Polygonoides*, the species common in Rajputana and Scinde and extending thence into Baluchistan; the bark, too, and the habit differ materially from those either of *C. Polygo no ides* or of *C. Crinitum* Boiss., of which latter the flowers are still unknown. The present plant has, however, sub-glaucous and striate branchlets as in *C. Crinitum*, and the writer would not have hesitated to refer it tentatively to *C. Crinitum* but for the existence of another Griffithian specimen from Afghanistan (K. D. n. 4139), issued as *C. comosum*, which seems to agree with our plant and which has fruits quite unlike those of *C. Crinitum*.

Strangely, both of these Griffithian plants (*Journal* n. 95 from Jaghun in Baluchistan and K. D. n. 4*39 *TM^m Afghanistan) are left unaccounted for by Meissner (*DC. Prodr.*, xiv) and by Boissier («. *Orient.*, iv). That the Afghan plant (n. 4*39) » n<*^c; *comosum* appears to the writer to be certain; it accords rather with *C. CapuUMedutz*; if it be the one species or the other, it cannot be the same as our plant, which has much smaller flowers than either. On the whole the evidence favours the idea that the plant represented by Griffith's n. 95 and by Maynard's specimens

is a species yet to be described, but in the absence of fruits a complete description cannot be given. It differs from Aitchison's undetermined n. 1104, which is a species of § *Pterococcus* apparently very near *C. Pallasia*; also from Aitchison's undetermined n. 267, which appears to be near *C. leuocladum*. Nor does it well agree with Aitchison's n. 30 distributed as "*C. comosum*?", but which is certainly not=Griffith's n. 4139 issued as *C. comosum* and is equally certainly not *C. comosum* itself.

34. RHEUM RIBES Gronov. *FL Orient.*, iv, 1003.
Kacha, 3,000 feet; Lon. 61°20' E., *Maynard*.

EUPHORBIACEJE.

35. EUPHORBIA OSYRIDEA Boiss. *Fl. Orient**, iv, 1092.
Hill-sides near junction of Shista and Lora rivers, 4,000 feet; Lon. 66°30' E., *Maynard*.

URTICACEJE.

36. Ficus CARICA Linn. *FL Orient.*, iv, 1154.
Kacha, 3,300 feet; Lon. 61°20' E., *Maynard*.

GNETACE^E.

37. EPHEDRA INTERMEDIA Schrenk & Mey. *Fl. Brit. Ind.*, v, 863. *E. pachyclada* Boiss. *FL Orient.*, v, 713; *PL Brit. Ind** v, 641.
Amir Chah, 3,300 feet; Lon. 62°35' E., *Maynard*.
A camel-fodder; the inhabitants burn this and mix the ashes with their tobacco.

IRIDEJE.

38. IRIS SISYRINCHIUM Linn. *FL Orient.*, 120.
Shorawuk plain, borders of Nushki, 3,000 feet; Lon. 66° E., very plentiful, *Maynard*.

LILIACEiE.

39. ASPHODELUS TENUIFOLIUS Cav. *FL Orient.*, v, 344; *Fl. Brit. Ind.*, v, 332. *Fl. Brit. Ind.*, v, 332.
Hill 8 miles west of Gazechah, 6,000 feet, Lon. 64°50' E., *Weo^m Ware*.
This is the *A. fistulosus* of Messrs. Lace and Hemsley's list. *Ind.*,
40. GAGE A PERSICA Boiss. *FL Orient.*, v, 210; *FL Brit.*, v, 355-
Plain 20 miles north of Nushki, 3,000 feet; Lon, 66° E., *Maynard*.

41. GAGEA AMBLYOPETALA Boiss. & Heldr. *FL Orient.*, v, 206.

Plain 20 miles north of Nushki, 3,000 feet; Lon. 66° E., *Maynard* %

GRAMINEJE.

42. CYNODON DACTYLON Linn. *FL Orient.*, v, 553.

Desert near Gazechah, 2,500 feet; Lon. 64°50' E., *Maynard*.

The creeping stems characteristic of the species in the Indian plains are here replaced by underground widespreading rhizomes, only stems 2 to 3 inches high appearing aboveground at wide intervals.

43. PHRAGMITES COMMUNIS Trin. *FL Orient.*, v, 563.

Kacha, 3,300 feet; Lon. 61°21' E., *Maynard*.

The specimens exactly accord with those issued by Stocks as *Arundo bengalensis* (Stocks n. 1113), which are not accounted for by M. Boissier.

FILICES.

44. ADIANTUM CAPILLUS-VENERIS Linn. *FL Orient.*, v, 730.

Gorge at Gargarok, 4,500 feet; Lon. 64°15' E., *Maynard*.

FUNGI.

45- AGARICUS CAMPESTRIS Linn.

Hill 8 miles west of Gazechah, 6,000 feet; Lon. 64°50' E., *Webb. Ware*.

LICHENES.

46. LECANORAsp.

Hill-sides near camp at junction of Shista and Lora rivers, 4,000 feet; Lon. 66°30' E., *Maynard*.

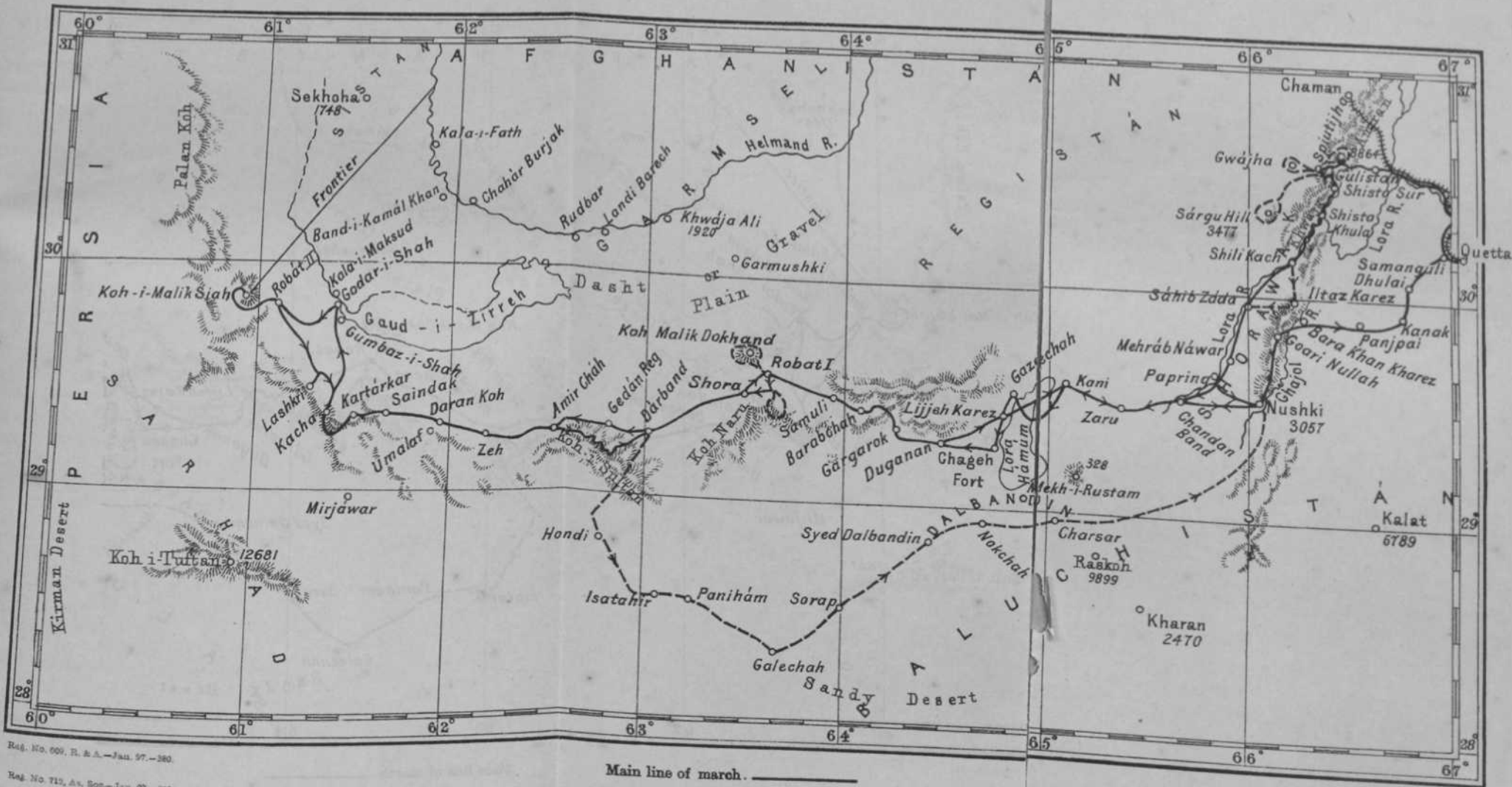
^m" A beautiful pink lichen with fine white margins.¹¹ This the writer has not been able to match in Herb. Calcutta.

Map ifyofaring roughly

THE EODTE TEATMED BY THE BALUOH-AraHAH BOONDABT

COMMISSION OF 1896.

Scale 1 Inch = 40 Miles.



Reg. No. 609, R. & A. - Jan. 97. - 380.

Reg. No. 715, A. & S. - Jan. 97. - 800.

Main line of march. ———
Places visited - - - -

Reprinted from the "Indian Forester," Vol. xxii, No. 12; December, 1896.

Eranji.

In the paper—*Indian Forester*, October 1896—on "Timbers in the Straits Settlements" by Mr. Henry J. Child, presented to the Association of Surveyors of H. M. Service, supplement to Foreign Station paper on Singapore and said to be "based upon practical experience and⁴¹ from frequent visits to the timber ponds and saw-mills about Singapore, as well as information obtained from reliable sources during "five years residence at this station" reference is made to *kranji* as "a large tree growing to a height of 60 feet with a diameter of 4 feet, "but is very uncommon in forests. The timber, which is of a dark "colour and fine-veined, is very hard and durable."

In his list of *Timbers in general use, Singapore*, Mr. Child gives the scientific name of *kranji* as *Bialium indicum*. There is no such species, but perhaps *D. indnm* is intended.*

D. indum has been longer known than any Asiatic species of the genus. It was first made known to Europeans by Botitius, *Hist, huh Or.* p. 93, under the name *Caravdje*, and it has been usual to assign to it in particular the Malay name *kranji*. It would appear, however, that the name *kranji* is genetic in its significance and is applied to most, if not to all, the Malayan species of *Dialium*. For, while, according to Bontius, t> Rumphius, and more recently, to Miquel and to Koorders and Valetton, the name indicates only *D. indum*, field-notes by Malayan botanists and collectors, on specimens in the Calcutta Herbarium, show that it may be applied to *D. laurinum* (Ridley 6437), to a form of *D. platysepalum* (Holmberg 221), to *D. Maingayi* (Curtis 440), and to what appears to be a form of *D. ambiguum* from Malacca (Derry 510 collected in 1892).f

According to Mr. Baker (*Flor. Brit. Ind.* II. 269) *D. indnm* was not known from the Malay Peninsula up to July 1878. It has, however, since then been reported from Pahang by Mr. Ridley and from Penang by Mr. Curtis. There is no means of deciding from Mr. Ridley's field notes or from the references to the genus in his paper on the *Flora of the Eastern Coast of the Malay Peninsula* {*Trans. Linn. Soc. n. s.* Vol. TIL* whether *D. indum* is « wild' in Pahang, but Mr. Ridley's silence on the point perhaps indicates that the tree may be indigenous there. With the Penang habitat it is otherwise, for Mr. Curtis notes the specimens as being from "Ayer Etam in Miller's compound" and

* *Indum* was meant. We regret the mistake.—*Eony. Ed.*

t There is another "510" collected by Derry in 1890, which is not the same ; >t is undoubtedly a form of *D. platysepalum*, but it bears the name *sepan*, not *fciai*yi. This affords an excellent example of the indosirability of collectors, no matter how thoroughly acquainted with a flora they may be, giving the same number to two different gatherings.

has a doubt as to the precise name of the tree; this he gives as *Rranji burong* or *Kranjipadie*. Both the situation of the tree and the dubiety as to its Malay name seem to indicate that, it is a stranger in Penang. The name *Kravji padie* does not occur on any other specimen at Calcutta, but the name *Kranji burong* accompanies a form of *D. platysepahim* (Holmberg 855) from Malacca, characterised by having clavate instead of orbicular pods. Another specimen, for which alternative names are given, is an example of *0. Maingayi* (Goodenough 1533) from Malacca which is cited as being *Kranji ambot* or *Kranji s* follat*. No other specimen bears the name *Kranji ambot*, but the name *Kranji s'kellat* is used twice (Deny 88; Goodenough 1693) for specimens, from Malacca, of the form of *D. platysepalum* with globose fruits. Still another name, *Kranji papan*, is used (Goodenough 1321) for a specimen of *1. laurinum*, but this name is used on two other occasions by the same collector (Goodenough 1225; 1553) for a very different plant,—the form of *D. platysepalum* with orbicular but distinctly compressed, not spherical pods.

There are several other species of *dialkm* in the Malay Peninsula, (*d. patens*, *D. Kunstleri*, *D. Wallichii*, *D. Kingii*) for which no native name has so far been reported, but as all have the same kind of *hvti*, and as it is with the fruit that the Malay associates most of his ideas of *•kranji*, there is little reason to doubt that any of them may bear the name, with or without some added epithet.

The point, however, that it is wished to insist on, is that the *kanji* of Mr. Child's paper may fairly well be any one of *nine* different trees, though with every probability of its *not* being the species that he supposes it to be.

Malay names are apparently quite as vague and unreliable in their incidence as Indian names can possibly be, and the present case affords an excellent instance of the risk that is run when reliance is placed upon them. And there is no certainty that the identity of the other timbers enumerated by Mr. Child is less obscure than the identity of his *kranji*

(Reprinted from Agricultural Series, No. 2. Department of
Land Records and Agriculture, Bengal.)

BULLETIN No. 3.

1896,



WHEAT.

[Dictionary of Economic Products, Vol. VI, Part IV, 634-834.]'

*Note on the races of wheat cultivated in Bengal—By SURGEON-CAPTAIN I.
PRAIN, Curator of Herbarium, Botanical Gardens, Shibpur, Calcutta.*

INTRODUCTION.

THE general belief that very many varieties of wheat are grown in the Lower Provinces, has led the Department of Land Records and Agriculture to wish to ascertain whether these varieties really exist, and if they exist, how they are to be recognized. During 1895, nearly 100 samples of grain from various districts were accordingly submitted to the writer for examination in the Herbarium at Shibpur. Finding the results of this examination to be inconclusive, the Director of Land Records and Agriculture was asked for, and granted, the use, during the cold season of 1895-96, of a portion of the experimental farm at Shibpur, in which to grow samples of wheat.

The results of the preliminary examination, though otherwise inconclusive, did at least indicate that the number of forms of wheat recognised has been much exaggerated, and that the most distinct of these forms, though possibly to be considered different races, in no case deserve to rank as separate varieties. And it^{ic} was found that while isolated examples of these races

are not, as a rule, difficult to determine, with the large suites of specimens supplied by the Department of Land Records and Agriculture, the separation of one from another is not always an easy matter.

The exaggeration of the number of distinguishable races appears to be largely due to the existence in different districts of distinct names for what seems to be the same form of wheat. And indeed, although as many as twenty-eight different names were sent attached to various samples of Bengal wheat examined, it has been found impossible to differentiate more than four clearly distinct "races."¹

The difficulties in distinguishing the different races lie in the fact that occasionally the same name is consistently applied in different districts to distinct races of wheat; that in some districts two names may be used as alternatives for one race, the same names being employed in other districts to indicate two distinct races; that some of the samples appear to be more or less intermediate in character between two races; another difficulty is caused by the mixed nature of some of the samples themselves. It was in order to ascertain whether it is possible to find in other organs any characters correlated incidentally or otherwise, with the apparently constant differences in the grain of these various races that the experimental cultures mentioned above were undertaken. Owing to the exigencies of routine work on the farm, and in some cases, to delay in the receipt of samples of grain, the sowings took place rather late in the season. Thus 27 samples, out of 97 sent, were sown on 31st October, 1895, 21 on 3rd November, 12 on 13th November, and 22 on 25th November. The remaining 15 arrived too late to admit of being sown. In giving the results derived from these experimental sowings, it will facilitate matters if the report be subdivided into three portions—(a) dealing with the botanical characters of the various races; (&) discussing the relationship of the races to the names by which they are known in Bengal; and (c) that explaining the distribution within Bengal, of the races and the names. In explanation of the last two plates are given; to illustrate the last, a sketch-map is appended.

BOTANICAL CHARACTERS OF THE RACES OF BENGAL WHEAT.

WHEAT—*Triticum sativum* Lamk.; natural order *Gramineae*; tribe *Hordeae*—is fully described, so far as relates to the North-West Provinces and Oudh, in Messrs. Duthie and



V
1,

Drawn by D. B. Clark

TRITICUM SATIVUM, Lamk.

Lith by K. P. Bass

Puller's *Fiell and Garden Orops*, part i, pp. 1-8, and is very exhaustively monographed by Dr. J. Murray in Dr. Watt's *Dictionary of Economic Products*, vol. vi, part iv, pp. 83-168, Dr. Watt himself adding a full account of the trade in Indian wheat, *he. cit.*, pp. 168-202. The present notice deals only with wheat in Bengal. The following is a systematic diagnosis of the plant:—

An annual herbaceous cultivated grass. *Stems* many, 2-3 feet high, erect, cylindric, hollow except at the swollen, somewhat hairy joints, smooth and glaucous. *Leaves* few, distant; sheaths long, not inflated, lying close to stem, smooth above, usually hairy beneath; ligule short, ragged; blade 6-18 inches long, linear, gradually narrowing to a point, smooth or with a few scattered hairs, ciliate at the base, green and glaucous. *Flowers* in small, sessile, compressed 3-5-flowered spikelets; with always a barren end-flower, distichously arranged on the two sides of a flattened excavated hairy rachis in an oblong, linear, sometimes round, sometimes almost four-cornered head 3-5 inches long, a few of the lowest spikelets usually being abortive and barren. *Glumes* 2, equal, boat-shaped, oval-oblong, hard, smooth and polished; the midrib extended into a sharp point with forward prickles. *Pales* 2, about equal in length, the lower boat-shaped, obtuse, mucronate or awned; the upper thin, papery, transparent, with two lateral nerves; edges inflated, ciliate. *Lodicules* 2, hairy at the top. *Stamens* 3, filaments slender, anthers large, protruded at the time of flowering. *Ovary* obovate, truncate, hairy at the top; stigmas 2, nearly sessile, feathery. *Fruit* enclosed within, but not adhering to, the pales, $\frac{1}{2}$ inch long, ovoid or oblong, flattened and grooved on the inner side, white, yellowish-white or grey to sandy-coloured, reddish or brown. *Embryo* very small, on the outer side at the base of the hard glutinous or floury albumen.

In illustration of this description, PLATE I, of which the following is an explanation, should be consulted.

EXPLANATION OF PLATE I.

TBATICUM SATIVUM Lamk.

- 1- Entire plant, about } natural size.
2. Spike in flower.
3. Maturo spike.
4. Spikelet.
5. Single flower, enlarged.

Chiefly derived from Duthie and Fuller's *Field and Garden Crops*, part i, Plate IB.

There are several characters that may be used in subdividing the races of wheat. That most employed by the grain-dealer is the consistence of the grain, whether soft or hard. That most employed by the cultivator is, on the other hand, the colour of the grain, whether some shade of brown or red, or some shade of yellow or grey, on to pure white. Both methods have the advantage of depending on character apparent in the ripened grain; they have, however, the disadvantage of crossing each other, since hard wheats and soft may alike be red or white.

A very patent character as the wheat grows is the presence or absence of awns, enabling the classification into 'bearded' and 'bald' wheats respectively. But it ceases to be of use when the grain is removed from the straw, and has besides the disadvantage of crossing both the preceding characters: hard or soft wheats, whether red-grained or white, are now *bearded,¹ now ⁴ bald/ Another disadvantage is the character is not quite constant; a normally *bald' wheat n *sports' here and there in a field into plants with 'bearded' ears a *vice versa*. Moreover, especially in India, wheat is at times spo as *bald^f when it is distinctly, though shortly, awned.

Lastly, the leaf-blade differs decidedly in breadth in different races, and this character is found on the whole to accompany, with some like regularity, the colour characters of the grain; -white or wheats, whether soft or hard, have as a rule distinctly broader blades than red wheats. But the character taken by itself is much practical utility; being a purely relative one, it cannot be nitely applied. Even its relative application, easy in the of samples growing in adjacent plots, and there also of some value, becomes difficult and unsafe when it is a question of plants growing in distant fields. There are, besides, in Bengal exceptions to its occurrence; a form of red-grained soft wheat without awns reported from Singhbhum has broad leaves; an early-ripening form of white-soft-grained wheat has narrow leaves. Finally, it may fail to be of use even under ordinary circumstances, for a weakly of a normally broad-leafed race, though it may have wider leaf-blades than a similar plant of a normally narrow-leafed race, may have leaf-blades *actually* narrower than in a strong, well-grown plant or narrow-leafed class.

Differences within the flowers themselves do occur in wheat; these differences enable the distinction of varieties as opposed to races, the best and most familiar example of

thus being the wheat known as "spelt." In Bengal, however, no such differences appear to occur, so that floral characters are of no assistance to us. And even if the presence or absence of awns had been associated in any definite fashion with the differences in colour and consistence of the grain, the character would not be of any practical utility in Bengal, since in this province bald wheats are hardly known. Among the 82 samples of wheat grown at Sibpur, only two bald forms have come up; in neither case were all the plants bald, and in no case was the awn entirely absent. Both came from Chota Nagpur.

Objection may be taken to the colour character owing to a belief, which prevails in certain districts, that in particular soils a white wheat may change into a red one. The writer has not met with the belief outside Bengal and has seen nothing to help him to credit the statement. Others have, however, found evidence that leads them to entertain the belief not only that there is ground for the statement, but also that the explanations hitherto offered to account for the phenomenon, supposing that it does occur, are inadequate.* The point can only be settled by local experimental investigation.

In any case there is no doubt that the most convenient primary subdivision of wheats is, as Messrs. Duthie and Fuller have already insisted, "into starchy and glutinous or soft and hard, the former containing a larger proportion than the average of starch and being thus especially fit for the production of fine flour (*maida*), while in the wheats of the latter class gluten predominates, rendering the grain especially productive of semolina (*si i*)."†

The writer finds, however, that it does not interfere with the convenience of the classification, while it appears to render it more natural, if the characters derived from colour are combined with those derived from consistence. In this it will be seen that he practically adopts the classification of Indian wheats employed by Dr. Forbes-Watson. The great advantage of associating colour with consistence is that a classification can thus be obtained which appeals alike to the dealer and to the cultivator.

During the course of these experimental cultures at Sibpur the wheat was severely attacked by 'rust'—early in the season by one against which barley is immune; later on by a rust that affects wheat and barley equally. The

* *Compaic Dictionary of Economic Products*, vol. vi, part iv, p. 165.

ravages of the first blight—whether owing to the rust having attacked the plant at an earlier stage or not is hardly as clear as might be wished—did much more harm in the way of destroying plants or dwarfing the grain of those that survived, than did the later blight which outwardly at least seemed quite as formidable. It was observed that the hard or glutinous wheats proved more resistant to the earlier blight than did the soft or starchy wheats; no race, however, could be said to have proved in any way immune. The later blight—that which attacked barley as well as wheat—affected all the races of wheat equally.

A key to the principal kinds of Bengal wheat is given beneath ; in illustration of this key, PLATE II, of which an explanation is added, may be consulted.

EXPLANATION OF PLATE II.

GRAIN OF BENGAL WHEATS.

Dudhia; shown from before in transverse and from side in vertical section.

Ohyo changmed; seen obliquely from side so as to show also ventral furrow.

Jamali; seen from behind.

Piusa; seen obliquely from side so as to show also furrow.

Oangajni; seen from before; also shown from behind in transverse and from side in vertical section.

Kheri; seen from behind; also shown from side in vertical section; half-grain shown from in front in transverse section.

As *ghya changmed*, *jamali* and *piusa* agree in shape with *dudhia*, it has not been considered necessary to show sections of these. All the grains have been drawn six times their natural size.

KEY TO THE PRINCIPAL KINDS OF BENGAL WHEAT.

• Grain soft, plump, with rounded outline;
easy to break or bite, with a dull white
mealy fracture :—

t Grain white ; leaves usually broad „, *Dudhia*.

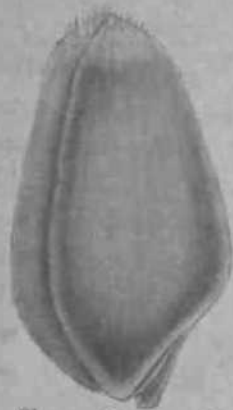
tt Grain reddish or brown:—

J Grain dark brown, leaves broad, heads
b*ld — *Ghyo changmed*.

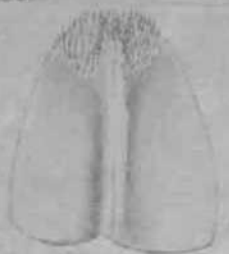
Xt Grain rather pale-red, leaves narrow,
heads bearded:—

§ Grain fairly large :—

1 Grain ripening early „, *Magia*.



Chyo Changmed



Dudhia



Pusa



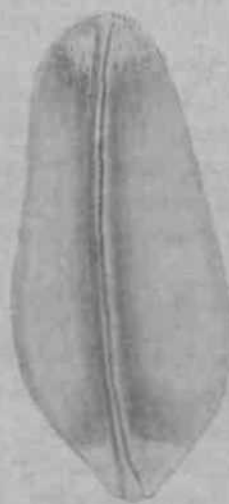
Jamali



Dudhia



Gangajuli



Gangajuli



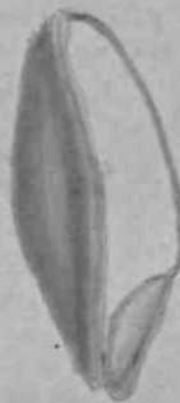
Gangajuli



Kheri



Kheri



Kheri

- ¶¶ Grain not early ripening ... *Jamali*.
 §§ Grain very small *Piusa*.
 ** Grain hard, elongated with subangled
 outline; difficult to break or bite, with a
 clear flinty fracture:—
 t Grain pale-grey, large; leaves broad ... *Gangajuli*.
 tt Grain reddish; leaves narrow :—
 J Grain medium *Kheri*.
 %X Grain very small *Namibia*.

[*Jamali* and *piusa* and *magia* are probably only forms of one race; the form *nanbia* bears to *kheri* the relationship that *piusa* bears to *jamali*. Two notable intermediate forms occur; these are *champapuri*, a rather variable intermediate between soft-white and soft-red; and *hara*, connecting soft-red with hard-red.]

CLASS I.—SOFT-WHITE.

Dudhia is a very distinct race with soft, plump, milk-white grain; in all the samples, save one which came from Bankura, it had broad leaves. Only one sample of this race with 'bald' spikes was sent; it came from Palaman. It is impossible to separate, by their grain, either the * 'narrow-leaved' or the * 'awnless' forms from the usual type. To this race belonged 23 samples, or about 25 per cent, of the whole sent. With the exception of the narrow-leaved early-ripening form already mentioned as coming from Bankura, and of two perfectly typical samples sent (under the name *jamalkhani*) from Muzaffarpur and Darbhanga respectively, all the samples of soft-white became severely rusted.

CLASS II.—SOFT-RED.

Ghyo cJiangmed.—This also is apparently a distinct race; **only** one sample, however, was sent (from Singbhum), **and** it is therefore perhaps premature to pronounce definitely regarding it. The grain is soft and plump—exactly as in soft->vliite—and when broken across the fracture is pure white; the leaves are broad as in soft-white; the heads are awnless ^{or} have only short awns. But the grain externally is darkish, umber-brown—darker in shade than in any of the other red-wheats; with so many distinctive marks it is

difficult to add it to any of the other red races. In spite of the dark colour of its grain, it is perhaps more nearly allied to the wheats of the soft-white than of the soft-red class.

Jamali is the 'soft-red' wheat of Bengal *par excellence*. It has a plump grain not quite so soft as in soft-white (*dudhia*) or as in *changmed*; it does not break or cut so easily or with quite so mealy a fracture, nor is the grain as a rule quite so large; though good samples are much the same in size of grain as the usual samples of 'soft-white' they are not comparable with the finest samples of *dudhia*. The leaves of this race are always narrow, and in no instance were there any 'bald' plants among the samples. This is the commonest race in Bengal, 45 of the 97 samples, or 46 per cent, of the whole, belong to it. In nearly every case this suffered considerably from rust, the chief exception being a very early ripening form sent from various districts. In three instances this particular form received the distinctive name *magia*; in some other cases it was simply sent as *jamah*—in one case was it found possible to distinguish it in any way from or 'soft-red' except by this character of coming early to maturity.

Phisa.—This is at best a subrace only to be distinguished from *jamali* by the small size of its grains, which are one-third shorter in the ordinary 'soft-red.' As it grows the plant, and when looked at in bulk, the grain in this case more resembles the hard-red (*khen*) race than it does the soft-red (*jamali*) race. The grains, however, though small are nevertheless soft and of rounded outline, and it is probably classed at least alongside of *jamali*, of which it is most probably only a degenerate form.

CLASS III.—HARD-GREY.

Gangnjulu—*Thia*, like *dudhia*, is a very distinct race; it has a long, hard, angular, grey grain, and has with all the Bengal samples broad leaves and a bearded head. Although much cultivated in other parts of India, it is not common in Bengal, only six samples, or 6 per cent, of those sent for examination, being of this kind. This is the hardest-grained of all the races; the fracture of the grain is clear and flinty. The grain, though not of greater diameter than in *dudhia* and therefore hardly of equal cross-section, its outline being angular, is appreciably longer and so, bulk for bulk, the two sorts weigh much alike. So far as 1891

is concerned, no indications of transitions between this and soft-white wheat are to be met with.

CLASS IV.—HARD-RED.

Kheri.—This is a very common wheat in Bengal, 19 samples or nearly 20 per cent, of the number submitted for examination belonged to it. It bears to Bengal 'soft-red' (*jamali*) wheat much the relationship that the *gangajuli* bears to the *dudhia* race, with the difference that, whereas good samples of *gangajuli* have grains as broad as, and always longer than, the best samples of *dudhia*, the best samples of *kheri* have grains that do not exceed in length, and are always narrower than those of *jamali*. In *kheri* the grain is always of a reddish tinge and breaks with a flinty fracture; it is, like *gangajuli*, angular in contour. This race, in Bengal, has always narrow leaves and a bearded head. Like *gangajuli* this is somewhat resistant to the effects of 'rust,' but in a slightly less-marked degree; its grain is never so difficult to bite or break as *gangajuli* grain, and is thus less clearly distinguishable from 'soft-red'¹ (*jamali*) wheat than the 'hard-grey' (*gangajuli*) wheat is from the 'soft-white' (*dudhia*) wheat. Indeed, there were a number of samples from North Behar named *hara* wheat that seemed almost precisely intermediate between *jamali* and *kheri* in consistence and appearance. A very small form of *kheri* was sent from Purnea as *naribia* wheat; this practically bears to *kheri* the relationship that *piusa* bears to *jamali*.

NAMES USED FOR THE RACES OF WHEAT IN BENGAL.

Distinctive names were attached to 83 of the 97 samples submitted for examination. Seven samples were only marked 'country' (*deshi*) wheat; one was described as 'acclimatised up-country seed;' six samples had no distinguishing mark. In most instances only one name was applied to a sample; in four cases, one each from Monghyr, Murshidabad, Muzaffarpur, and Rajshahi, alternative names were used. The number of names or variants of names employed was twenty-eight; in briefly reviewing them with reference to the races they indicate, it will be most satisfactory to arrange them in alphabetical order.

Bum goma=Jamali.—Once used, and then only as an alternative name for *jamali*, with a sample from Rajshahi that *did* belong to the *jamali* race.

Bargehima.—This term was used three times; once, not inappropriately, for a large-grained form of *jamali* (soft-red) from Gaya; again for a sample of soft-red, but with some soft-white mixed, from Moughyr. In the second instance the grain was of a very ordinary quality indeed, and the name was quite inappropriate. The last occasion was in connection with a specimen from Purnea sent to the Royal Botanic Garden; the sample was very pure *gangajuli* (hard-grey; white) so that the name was quite appropriate. But the collector of the sample had given as an alternative name the word *liara*, used in Beliar for a 'red' wheat, and the corresponding sample sent to experimental farm was *kheri* (hard-red) wheat, not the wheat previously sent to the Royal Botanic Garden.

Champauri Dudhiak Jamali.—This also is a term for which exact equivalent can be given. It was attached to two samples, one from Gaya, the other from Darbhanga; the Gaya sample, pale 'soft-ied' (*jamaK*), the Darbhanga one a dark 'soft-white' (*dudhia*) wheat. They did not exactly agree in shade, but were obviously intermediates between true *yawiazi* and true *dudhi*.

Dudkia.—This name, adopted in the previous chapter to indicate one of the distinct cultivated races, was applied to 17 samples. In 16 cases the race indicated was a soft wheat with, as the name seems to imply, a milk-white grain. The exception was a sample from Katwa in Raniganj, soft-red (*jamali*) wheat. But two other samples from Raniganj were correctly named, so that probably the error was rather to some confusion of tickets by the collector of the samples than to a want of knowledge on the part of the cultivator. One of the samples, named *daudi*, came from Palamau, but on being cultivated, it was found that the race indicated was a 'bald' wheat—the only example of the white wheat so common in Upper India, met with among the samples from Bengal. The 'bearded' white also was sent from Palamau, but under a different name, *mudalia*. The name *eropye* it will be seen, is a variant of the ordinarily accepted name. The same variant, *daudi*, was used also in connection with the samples of *bearded-white* from Gaya, Patna and Saran; its existence makes it necessary to refer to the controversy—which has been very ably discussed by Dr. Forbes-Watson—to the origin of the name. As usually employed in Bengal, the name seems intended to indicate the colour of the grain. Obvious, however, as this derivation appears to be, it is not impossible that originally the name was *daudi* (David's) wheat. The occurrence, though not in

Bengal, of another variant *dandkhanl* (Prince David's) wheat rather tends to confirm his conjecture. Indeed, the form *dudhia* (milk-white wheat) is apparently confined to Bengal, where there is no doubt wheat is altogether more or less of an exotic; it may have originated from a mistake as to the significance of the name that had accompanied this particular race from Upper India. In South Bihar the name as used in Upper India has remained unchanged; in North Bihar the name *daudi*, only accompanied a sample from Saran; in other North Bihar districts neither the South Bihar nor the Bengal form is used, for soft-white wheat in Champaran, Muzaffarpur and Darbhanga is known as *jamalkhaii i*.

Gangajuli.—This also is a name adopted in the previous chapter to indicate one of the distinct natural races. The idea wished to be conveyed apparently is that the wheat has a grain of the colour of the water of the Ganges. A good deal will obviously depend upon whether the cold weather stream is meant or if the full stream during the rains is thought of. Presumably, however, the cold weather stream—the river as it appears during the wheat season—was intended originally. In any case, of eight samples to which the name is applied, five, from Bankura, the Son thai Parganas, Rajmahal, Murshidabad and Malda, respectively, belong to the 'hard-grey' race, for which the name is here adopted and which has a grain in colour not unlike the Ganges during the cold weather. The other three samples are, however, 'red' wheats, two, from Purnea and Rajshahi, respectively, being hard-red (*Icheri*), the third, from Nadia, being soft-red (*jamali*) wheat.

GatiaszJamnli.—A name applied in the Rajshahi district to 'soft-red*' wheat. The term occurs twice, once from Rajshahi itself, where *t applies to common *jamali*; once from Nator subdivision, where it applies to *piusa*.

Ghyo changmed.—Only once used; the sample is from Singhbhum and differs in so many characters from any other sample that it has been treated in the preceding chapter as the type of a distinct race. The meaning of the name the writer has been unable to learn.

Badila=Jamali.—Twice used, once with a Champaran sample and once with a sample from Muzaffarpur. Both wore 'soft-red' (*jamali*) wheat.

Hara=,Jamali xKheri.—This name occurs in connection with ^{8e}ven samples, and appears to be confined to the country ⁿorth of the Ganges from Ohapra to Malda. It is not, however, within that area at all uniformly applied.

Four examples, one from Purnea, one from Darbhanga and two from Muzaffarpur, are perhaps best classed with hard-red (*kheri*) wheat. As regards the Purnea sample, indeed, this is undoubtedly the race represented by the specimens sent to the Sibpur Farm, though it has already been explained that the specimen sent to the Calcutta Herbarium was not hard-red, but hard-grey (*gangajuli*) wheat. The Darbhanga *hara* and the two specimens from Muzaffarpur were quite like each other, and represented a wheat that in outline and appearance resembles *jamali*, but that has the hard grain of *kheri*. Two samples with this name, but in a modified form, one from Chaprasentas "Siwan" *hara*, and one from Darbhanga, sent as *hara hara*, were unequivocally 'soft-red (*jamali*)' wheat. Finally, the Malda *hara* (in this case, however, the name was only used as an alternative one) was the fine 'hard-grey' wheat that, to the south of the Ganges, is known as *gangajuli*. This is undoubtedly the most unsatisfactory of all those sent.

Jamali.—This name, variously transliterated *jamali*, *jamuli*, *jmjmali*, and (in one instance) *joyali*, was used with 16 samples of wheat. All were the same race, «soft-red/ Though it accompanied rather less than half the total number of examples of the race sent, the name may, not inappropriately, be used to designate 'soft-red' wheat for the whole province. Two variants occur, neither of which applies to the 'soft-red' race :—

Jamali ali Gangajuli*—The first of these variants was only once used, and then as an alternative name with *hara* for a sample from Malda of 'hard-grey' wheat.

JamalkhanizsDudhia.—The other variant is interesting as being very consistently applied in North Bihar, where alone the name occurs, not to 'soft-red' (*jamali*) wheat, but to the 'soft-white' (*dudhia*) race. This is the case with four samples, one from Darbhanga, one from Ohamparan, and two from Muzaffarpur. With a fifth sample—the third from Muzaffarpur—the term was used as an alternative name with *hara* for one of those doubtful samples with grain like that of *jamali* in appearance and like that of *kheri* in consistence.

The name *jamali*, especially when the existence of the TOtmut jamaMani is taken into consideration seems probably 4 pern* ri^ ttmtik «* W^v 'v T unable to ascertain whether any fJJ- TM* ka Wu these wheats with any VviL J'oh, **** a8SOciatin* tradition exists that associates the wite J' wh^ts * -T with a Prince David.

KazUa^KJieri.—This term was used only once for a specimen from Rajshahi—Nator subdivision. The sample was a form of 'hard-red' (*hheri*) wheat with rather larger grain than usual.

J£ewalka=Jamcdi.—Another term used only once. The sample was from Gaya; the wheat was soft-red, not distinguishable by its grain, or as it grew, from the ordinary *jamali*; the name means "wheat of clay-land."

Kheri. - This name, varying in transliteration as *kliouri*, *fcheuki* and *hhtkri*, was given in connection with seven samples, all of which were ¹ *hard-red' wheat. The name has been adopted to indicate that race. In an eighth instance (from Murshidabad) it was used as an alternative name for *jamooli*; the wheat sent in this instance was, however, *soft-red* (*jamali*).

Lai, Lali=Kheri,—Once used, for a Muzaffarpur sample, this indicated rounded *hard-red' (*kheii*) wheat.

Laika=Jamali—On the other hand the term *lalka*, used with samples from Hazaribagh and from Palamau, respectively, indicated ¹ soft-red' (*jamali*) wheat. Not improbably both *lalka* and *lal* are used indiscriminately for red wheats, whether soft or hard; so far, however as the samples submitted go, the usage is as above.

Magia=Jamali.—The name *magia*, *moghia*, *mughia* was used three times with samples from Patna and from Bankura. All three were soft-red (*jamali*) wheat not distinguishable from ordinary *jamali* by their grain, but very easily detected in the experimental field by their ripening more rapidly than the other sorts, and from their being, perhaps as a consequence of this early ripening, less affected by rust than their neighbours. The name means "ripening in *magh*" (Jan.—Feb.).

Mudalia=Dudkia.—This name occurred only once with a sample of bearded soft-white (*dudhia*) wheat from Palamau. As has been explained already, the name *daudi* was sent from Palamau with a sample of bald soft-white wheat.

Nanbia=small Kheri.—This name was used once for a Purnea sample of 'hard-red' with very small grain. The form bears the same relation to ordinary *Jcheii* that *pira* or *piusa* bears to *jamali*.

Pirajome=Fiu,sa.—Once used from Chapra for a sample of soft-red wheat with very small grain.

Pi«sa=small Jamali.—This name is here adopted for the small grained soft-red subrace mentioned in the preceding paragraph. The form occurs not infrequently in North

Bihar and North Bengal, and is in every case fairly easily recognised. This particular name was, however, used only once for a sample of the subrace from Patna.

2Yitf.—This is probably only a variant of the preceding. It occurred in connection with two samples, one from Rajshahi, the other from Murshidabad; neither of these, however, was the same as *pinsa*. The Rajshahi wheat so named was hard-red (*kheri*); the Murshidabad one, on the other hand, was the ordinary soft-red (*jamali*) wheat with fairly large grain.

Shah b(tgan=Kheri.—This name was attached to only one sample from Ghapra; the grain was a poor specimen of rounded hard-red (*kheri*) wheat largely mixed with barley.

Shona tiklia—? GangajuU.—This term was only once used, in connection with a very mixed sample from Mālda, consisting of about 25 percent, soft-white (*dndria*) wheat and 25 per cent, soft-red (*jamah*) wheat, the remainder being hard-grey (*gangajuli*) wheat. The name is most applicable, of the three, to the last-named race, and this, taken into consideration with the fact that *gangajuli* was more largely present in it than the other kinds, makes it probable that *gangajuli* is the wheat which the mime indicates.

The seven samples marked 'country' (*deshi*) wheat were not uniform. Four samples from south of the Ganges and west of the Bagirati (one from Raniganj, two from Bankura and one from Lohardaga) were soft-red (*jamali*) wheat; three from north of the Ganges and east of the Bagirati were hard-red (*kheri*) wheat; these came from Ohnpura, Rajshahi and Faridpur, respectively. It is to be noticed, however, that all the so-called 'country' wheats were red. The sample from Muldī already alluded to, that was sent as "acclimatised up-country seed" was soft-white (*dudhia*), but of the bearded * not the «bald' subrace.

The samples sent without any distinguishing mark also were not uniform. One from Arrah, one from Raniganj and one from Bankura were soft-red (*jamali*) wheat, two others from Bankura and one from Burdwan were hard-red (*kheri*) wheat.

DISTRIBUTION OF THE NAMES AND RACES OF WHEAT IN BENGAL.

The samples of wheat transmitted from different parts of Bengal give no clue to the extent to which wheat is cultivated in the Lower Provinces. This portion of the

subject does not, however, come within the scope of the present notice. But what may be remarked on is the fact that, as indicated by these samples, there is an area within which wheat is cultivated, beyond which wheat does not occur.

No samples have been received from the Orissa districts of Puri, Cuttack and Balasore; none from Midnapore or from Hooghly-Howrah, the two districts of the Burdwan division of Bengal Proper nearest of Orissa and to the coast; none from the 24-Parganas or Jessore, which are the two corresponding Presidency districts; none from the Sundarbans and none from the Cliittagong Division (Noakhali and Chittagong). With the exception of a solitary sample from Faridpur, no samples have been sent from the districts of the Dacca Division, nor have any samples been received from the northern districts of the Rajshahi Division (Bogra, Dinajpur and Rangpur). And finally, no sample has been sent from Manbhum, the district of Chota Nagpur lying immediately to the west of Midnapore.

Judging by the samples received, the culture of wheat, whether extensive or not, appears to be wide-spread in Behar, specimens having been sent from every district. From the number of samples sent it seems probable that the cultivation of wheat is more extensive in Western Bihar (Patna Division) than in Eastern Bihar (Bliagalpur Division). In Chota Nagpur also the culture is fairly general. Samples have been sent from all the districts except the most easterly (Manbhum). In the central portion of Bengal Proper, the cultivation appears to be fairly general throughout a belt of country that narrows gradually towards the east; this area includes the districts of Bankura, Birbhum and Burdwan in the Burdwan Division; of Nadia and Murshidabad in the Presidency Division; of Rajshahi and Pabna in the Rajshahi Division*, and of Faridpur in the Dacca Division.

The cultivation of the individual races of wheat appears, however, to be somewhat decidedly limited within this area. Broadly speaking, the country lying to the north of the Ganges and to the east of Magirati, hard or glutinous wheats are much grown; in the country lying to the south-west of this area practically only soft or starchy wheats are cultivated.

The distribution of the HARD or GLUTINOUS wheats is, on the whole, more strictly limited than that of the soft or starchy ones it may therefore be dealt with first.

South Bihar and Ohoia Nagpur.—From the area that deludes the districts of Shahabad, Gaya, Monghyr,

Bhagalpur and the Sonthal Parganas in South Bihar, as well as from Hazaribagh, Lohardaga and Singbhum in Cbota Nagpur, no sample of hard-red (*Jcheri*) wheat has been received. The only two samples of hard-grey (*gangajuli*) wheat that came from this area were from Pakom and Bajmahal in the Sonthal Parganas, and it is to be noted that they come from two localities immediately across the Gauges from Malda, where the cultivation of this race seems to be general.

North Bihar.—Throughout the area that includes Saran, Muzaffarpur and Darbhanga, a special form of hard-red wheat is widely cultivated. This is the form that differs from ordinary *klmi* in having seeds with rounded outline as in *jamali* wheat. The colour, however, and the consistence of the grain are such as characterise *kheri*. In Chapia hard-red is known as *Shah lagan* wheat, in Muzaffarpur it is known as *lali* and also as *hara*; in Darbhanga, too, the name *hara* is used. The name *hara* recurs in Purnea, and is there applied to true *kheri*; it also extends to Malda, but is there given to hard-grey wheat.

Purnea is the only district in North Bihar whence the true hard-red (*kheri*) wheat has been sent; one of the samples had very small grain and received a special name (*nanbia*); no hard-red of any kind has been sent from North Bhagalpur or from Champaran.

Bengal Proper.—From Faridpur the only sample sent was hard-red (*Jcheri*) wheat; it bore, however, only the name *deshi* (country) wheat.

In the compact area that comprises the districts of Malda, Rajshahi, Pabna, Murshidabad, Nadia and Birbhum, hard-red wheat is commonly cultivated and is always consistently named *Jcheri*. In Rajshahi, indeed, considerable attention seems to be bestowed on this race, for from Nator subdivision comes a sample with unusually large grain distinguished as *kazlia*; this name does not occur elsewhere. A second sample comes also from Rajshahi marked *piuti*; this sample is merely ordinary *kheri*. The same name was associated with a sample from Murshidabad, but the Murshidabad *piuti* was soft-red wheat.

Westward from the area indicated, the cultivation of hard-red (*kheri*) wheat extends into Burdwan and Bankura; in these districts, however, it is significant that the race bears no special name.

Hard-grey (*gangajuli*) wheat is common in Malda district, and appears to be practically the only kind of wheat cultivated there. It is, however, known as *jamali ali* and

as *shone tiklia* Wheat, as well as *gangajuli*; but there do not appear to be any tangible differences between the wheats of the samples so named. The name *gangajuli* extends into Purnea on the one hand and into Rajshahi on the other, but the samples sent from these districts were hard-red wheat.

Hard-red (*gangajuli*) wheat has also been sent from the Bhagwan-gola subdivision of Murshidabad; this is simply an extension from Malda of the area in which the cultivation of this form of wheat is localised. An isolated locality, however, occurs in Bankura. A sample has been sent from the Onda subdivision bearing the name *gangajuli* and belonging in reality to the race. The name *gangajuli* was attached to a sample from Nadia also, but in this case the wheat was of the soft-red (*jamali*) race.

The distribution of the SOFT or STARCHY wheats has now to be considered; it will be most convenient in this case to deal separately with the red and the white races.

The soft-red race of bald wheat described in a former chapter as *Ohyo changmed* was only once sent from Singbhum district; it is impossible to say whether it has originated there or is an introduction from some distant province.

The ordinary soft-red (*jamali*) wheat is the most widely cultivated of all the races in Bengal.

South Bihar and Chota Nagpur.—This is the only wheat sent from Shahabad; the sample came from Sasaram and bore no name. From Patna two samples were sent, *magia*, the early ripening form, and *piusa*, the small-grained form; no true *jamali* was sent from this district. From Gaya three samples were sent under the names of *horgehuma*, *vhampapuri* and *kewalka*, respectively; all were apparently ordinary soft-red, differing slightly in size and in colour, but not in shape or in consistence, *kewalka* being the precise equivalent of *jaynali*, *horgehuma* having rather larger and *champapuri* rather paler grain. From Bhagalpur, Monghyr and the Sonthal Parganas the samples were all sent under the name *jamali*. The sample from Hazaribagh was named *lulka*; that from Lohardaga was sent with the mere name *deshi* wheat, while that from Singbhum bore no name.

North Bihar.—*Jamali* wheat was sent from Muzaffarpur, Darbhanga, Saran and Champaran, but neither from Purnea nor from Malda. The Muzaffarpur and Champaran samples were termed *hadda* wheat: the Chapra specimen was sent as "Sewan" *hara*, the Darbhanga sample as *hara bara*. The name *jamali* was not sent from any part of North Bihar.

The small-grained subrace termed *piusa* at Patna was sent from Chapra as *pirajome*.

Bengal Proper.—From Bankura were sent as many as eight samples of soft-red wheat; two of these were termed *magia*, and both proved to be the early ripening form of the race; two were sent simply as *deshi* wheat; the other four were consistently named *jamato*. The same race came from Birbhum also with the name *jamali* but weirdly, the name *kheri* given as an alternative one. From the Kanai subdivision of Murshidabad the race was sent as *joyali* from Murshidabad itself it was sent *wpiuH*. No sample of *Jamali* came to Burdwan; but a sample sent from Nadia, named *gangajuli*, proved to be of the soft-red (*jamali*) race. Soft-red (*jamali*) wheat also extends to Rajshahi; samples have been sent both from Rajshahi and Natôr, and both with the same name (*gatia*), one being the ordinary, the other being the small (*piuaa*) form of the race; the name *jamali* was not applied to any Rajshahi sample. In Pabna, however, where this race also occurs, the name *jamali* reappears; it has been attached to a sample of soft-red wheat from Mathura sub-division.

Soft-white wheat does not extend so far to the east as does soft-red.

South Bihar and Chota Nagpur.—No sample of soft-white has been sent from Shahabad; it is, however, difficult to believe that it is not grown there. The samples from Patna and Gaya were sent under the name *daudi* and this name recurs on a sample from Lohardaga which is the only Chota Nagpur district whence soft-white wheat has been sent. But the *daudi* of Palamau proved to be a bald wheat, and was the only example of bald-white wheat reported. The more ordinary bearded form was also sent from Palamau, but with the distinctive name *mudalia*. The samples from South Bhagalpur (Banka), Monghyr and the Sonthal Parganas bore the usual Bengal name *dudhia*; one sample from Monghyr was named *bargehuma*; it did not, however, have particularly large grain: the *bargehuma* of Gaya, as already explained, was a red not a white wheat.

North Bihar.—The sample sent from Chapra was termed *daudi*, the name prevalent in the southern part of Western Bihar. All those sent from east of the Gandak river bore, however, the name *jamallchani*, which appears to be the prevalent name for white wheat in Champaran, Muzaffarpur and Darbhanga. A second sample from Darbhanga named *champapuri*; it was rather darker yellow in colour, thus connecting *jamali* with the usual *dudhia* wheat; the name



A. C. Mukerjee

SKETCH - MAP OF THE WHEAT 01ST RIOTS BENGAL.

Extrait du *Bulletin de l'Herbier Boissier*.

Tome V. N° 2. Février 1897.

AN UNDESCRIBED
ORIENTAL SPECIES OF ONOBRYCHIS

BY

David PLAIN

Plaque III.

Among the specimens preserved in the Calcutta Herbarium the writer finds represented a species of *Onobrychis* collected by D^r Bellew in Afghanistan in 1858 that does not agree with any named species in the collection and does not fit into any of the species described by M. Boissier in the *Flora Orientalis*. It has never again been reported by the collectors either of the Calcutta or the Saharanpur Botanic Gardens nor does it seem to have been met with by D^r Aitchison during his Afghan journeys. Mr. Hemsley, however, who has kindly compared the Calcutta specimen with the material preserved in the Herbarium at Kew, informs the writer that there are at Kew fragments of the same plant in fruit; these latter were obtained by D^r Wilson Johnston in the Logar valley during the cold weather of 1879-80.

The pod in this species clearly indicates that its most natural position is among the *Heliobrychidex* of the section *Sisyrosema* (Boiss. *Flor. Orient.*, U, 527); like the species *Onobrychis nitida*, referred with justice by M. Boissier to the *Hymenobrychideae*, this new species violates the sectional characters of *Sisyrosema* in having perfectly glabrous petals, except as regards the glabrous standard, however, it appears to be most naturally placed near *O. melanotricha* and *O. oxyptera* though it is quite peculiar among all the species known to the writer in having the fertile suture of the pod convex like the dorsal one, all other species having the fertile suture straight, concave or even circinnately bent.

The species, it will be seen, possesses considerably more interest than isolated new species usually do. The description that follows, which

has been made as parallel as is possible to the classical descriptions in M. Boissier's great work, is preceded by the blight necessary modifications in M. Boissier's admirable key to the genus.

ONOBRYGHIS

Sect. **II**. — **Sisyrosema** Bge in Boiss. *FL Or.*, II, 526. 539. — *Vexillum extus pubescens vel sericeum* {exceptis *O. Bellvii* et *O. nitida*}, *petala post anthesin diutius persistentia convoluta* (excepta *O. Bellevii*).

§ 4. — **Heliobrychidese** Bge in Boiss. *FL Or.*, II, 527, 539. — Ovarium 1 rarius 2-ovulatum. Legumen ecristatum margine et ssepius disco spinis vel setis plumosis obsilum.

* Legumen rectum monospermum uniloculare (petalis omnibus glabris).

O. Bellevii.

* Legumen plus minusve curvatum, etc. (*uti in Flora Oriental**)-

27 b. — **O. Bellevii** (sp. nov. *O. meianotrichm* prox. anteponenda) basi suffrulescens acaulis adpresse sericeo-puberula, foliis 8-10-jugis foliolis parvis ovato-lanceolatis acutis utrinque sericeo-puberulis, pedunculis folio parum longioribus, racemis demum laxioribus, calycis glabrescentis laciniis linearibus tubo dimidio longioribus, corolla (e sice, forsan) rubra, petalis omnibus glabris, alisspalulatis calyce multo brevioribus, legumine brevissime stipilala sutura seminifera convexo obovato acuto undique setis brunneis flexuosis obsilo.

Hab. in Afghanià, prope Khelat-i-Ghilzai ubi frequens in cultis (Bellew!); in valle Logar (Johnston, lide amiciss. Hemsley in lilt.).

Foliola 2-3 lineas longa, pedunculi cum racemo 3-4-pollicares, flores 4 lineas longi, legumen 6 lineas longum hoc 4 lineas la turn.

Calcutta, October 15<> 1896.

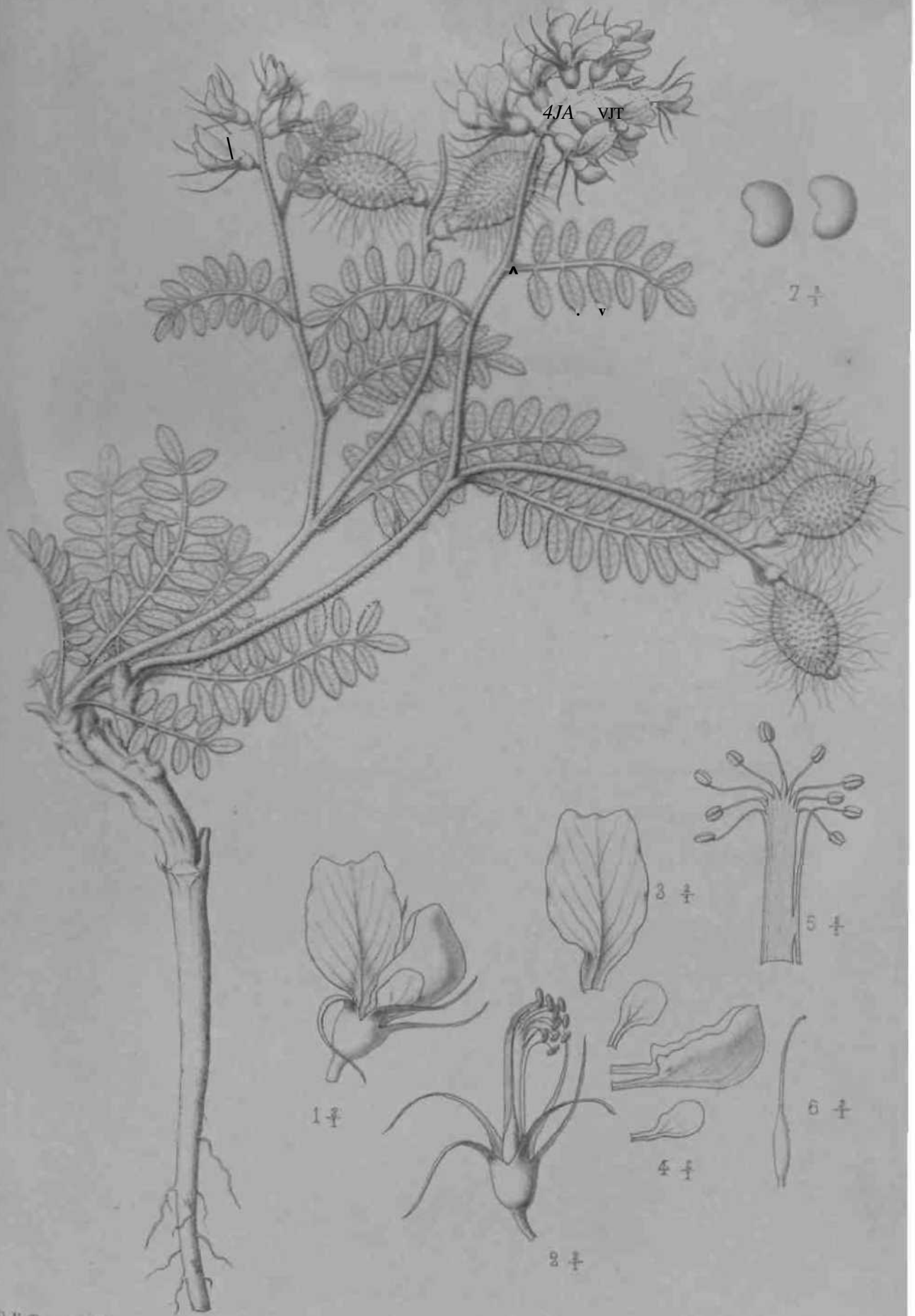


LÉGENDE DE LA PLANCHE HI

ONOBRYCHIS BELLEVII PRAIN. ad nal*

[Sp. from Khelat-i-Ghilzai.]

1. Flower.	I
	2
2. The same, petals removed.	*
	2
3. Vexillum.	1
4. Alae, aifd Carina.	i
3. Staminal Sheath.	i
6. Ovary.	2
	1
7. Seeds.	3
	1



4JA VJT

2 1/2

3 1/2

5 1/2

1 1/2

4 1/2

5 1/2

2 1/2

D.N.C. >mbante,

Imp^{tes} Lemerou s. Paris.

Cusman del.

ONOBRYCHIS BELLEVII PRAIN

A NEW CURCUMA FROM THE DECCAN.

BY D. PBAIN.

(With a Plate.)

{Read before the Bombay Natural History Society on 6th Dec, 1897.}

Some time ago Mr. N. B. Ranade, * in charge of the Poona Herbarium, during the absence, on leave, of Mr. Woodrow, sent to the Royal Botanic Gardens, Calcutta, some rhizomes of *Kaempferia scaposa*, a Scitamineous plant peculiar to Western India. Mixed with these rhizomes were some tubers evidently of a *Curcuma*. These latter were potted at the same time as the *Kaempferia* and one of the resulting Plants has just flowered.

The species proves different from any of those described in Sir J. D. Hooker's "Flora of British India," Vol. VI, 209-216, where Mr. Baker describes with the Indian *Curcumas*. A description of the plant, as nearly possible parallel to the descriptions of the others drawn up by Mr. Baker, is herewith offered, in the hope that it may be of use to those Members of the Bombay Natural History Society who are in the habit of insulting the "Flora of British India" in the field.

§ II. MESANTHA Horan. *Flower-spike* autumnal, in the centre of the tuft of leaves; bracts not recurved at the tip.

166. CURCUMA RANADEI Prain; rootstock small, sessile tubers 0; petiole rather long; leaves large thin ovate-lanceolate, cuneate at base, acuminate at tip; flower-bracts green faintly tinged with pink at their tips, those of the coma few mauve-purple; flowers bright yellow, considerably longer than the bracts.

DECCAN: Poona, *Ranade!* The plants were raised from tubers sent to Calcutta, where one flowered in the Royal Botanic Garden, September 1897.

Rootstock bearing numerous small almond-like tubers at the ends of fibres, the tubers compressed, pure white within. *Leaves* thin, blade 8 in. long, 4 in. wide, uniform green, stalk 8-15 in. long. *Spike* autumnal, central; the peduncle 4 in. long embraced by leaf-sheaths; the head narrowly oblong, 2 in. long, 1 in. across, with flower-bracts rather narrow 25 in. long, 6 in. wide, with an acute slightly pick tip, elsewhere pale-green; those of the coma lanceolate, 35 in. wide, the lowest with purple edges only, the upper more or less uniformly mauve-purple. *Flowers* large, 175 in. long, projecting beyond the

* Mr. N. B. Ranade died at Poona on 15th October, 1897.

bracts; staminode and lip uniformly bright-yellow, sub-equal, both or b: lar
and deeply two-lobed, lobes rounded obtuse. ic<

This interesting plant is very distinct from any of the others of its section
described in the "Flora of British India." From *C. attenuata*, *O' Amada*,
C. longa and *C. montana* it differs in having the tubers at the ends of fibres. From
C. albiflora and *G. oligantha* it differs in having a coma of barren bracts a
top of the spike. From *C. reclinata* and *C. decipiens*, with which, eB, ge
the latter, it agrees as to tubers, it differs in foliage, and in colour and
flowers; both have flowers shorter than the bracts, those of *G. reeling* being
reddish-yellow, those of *O. decipiens* being purple. The nearest to our P: 11
Burmese species, *C. plicata*; that specieB, however, has firmer leaves an
smaller paler flowers. The most remarkable feature about the plan
the flower-spike, the bracts, both fertile and barren, and the flowers
are hardly distinguishable from thoBe of *C. angustifolia* in size, colour or
The tubers of *C. angustifolia* are, however, fusiform (circular when cut ac
and not almond-shaped (narrowly elliptic in cross section), and t
course a radical difference between the two in time and mode of
C. angustifolia is a spring-flowering species with the flower-Bpike
the leafy shoot and developed before the leaves appear; in *C. Sana*
leaves and flowers appear together, the flower-spike being in the centre
tnft of leaves, and appearing in autnmn, not in spring. The leaves,
differ considerably, those of *C. angustifolia* having longer, narrower b a e
shorter stalks. m -- work

The species is named in honour of Mr. Banade, whose praisewonny
as Herbarinm Assistant at Poona, first under Dr. T. Cooke and later unath
Mr. Woodrow, was well known to Indian botanists, and whose untimely <ie
we all deplore.

EXPLANATION OF PLATE.

CURCUMA RANADEI, *Prain*.

1. Plant of *Curcuma Ranadei*: one-sixth natural size.
2. Ditto. showing two tubers and one leaf: nat st**.
3. Tuber of *G. Ranadei*, cut across: nat. size.
4. Portion of flower, laid open, showing stamen and pis
nat. size. til:



Chaudhari. del.

CURCUMA KANADEI Pram.

A.L. Stogia. Lith.

(Reprinted from Agricultural {Series, jJo. 3. Department
of Land Records and Agriculture, Bengal.)

BULLETIN No. 4 1898.



MUSTARD.

[*Dictionary of Economic Products, Vol. I, B. 799-855.*"]

*A Note on the Mustards cultivated in Bengal; by SURGEON-MAJOR
D. PEAIN, Curator of the Herbarium, Royal Botanic Garden,
Sibpur.*

SECTION I.—INTRODUCTION,

THE Director of Land Records and Agriculture, Bengal, desiring to obtain accurate information regarding the mustards cultivated in the Lower Provinces, in 1895 submitted to the Superintendent of the Royal Botanic Garden some 150 different samples of their seeds. These samples were made over to the writer for examination in the ordinary way. After an attempt to arrange them with the aid of Indian works on Botany, it was found necessary to abandon the task as hopeless: the names and information supplied with the samples were self-contradictory, and in many instances irreconcilable with the statements made by Roxburgh (*Flora Indica*, iii. 117-125), Hooker and Thomson (*Journal of the Linnean Society*, v. 169-172, and again in *Flora of British India*, i. 155-157), Duthie and Fuller (*Field and Garden Crops of the North-West Provinces and Oudh*, ii. 28-34), and, finally, Watt (*Dictionary of the Economic Products of India*, i. 520-534).

The only hope of settling the difficulties that beset the enquiry seemed to lie in following for Bengal the method adopted by Duthie for Upper India—in cultivating carefully all the kinds of mustard grown throughout the Lower Provinces, and comparing them in the living state at all stages of their growth. It was too late to do this in 1895, but the Director, on being requested by the writer to call for a second set of samples, was at the trouble to do so. These samples were sown on October 22nd and October 23rd, 1896, in a portion of the Sibpur Experimental Farm made over to the writer for the purpose. The plants were made the subject of study from the time of their germination till they were harvested. The present note embodies the results of this study.

Three different Mustard

The cultivation of these plants has shown that the confusion amongst the Bengal mustards is largely an affair of names and statements: as regards the plants themselves, there is little difficulty. Practical!^ there are but three mustards cultivated in Bihar and Bengal. These three constitute the familiar *lai*, *Sarson*, and *Tori* crops. Each one of the three varies within its own limits to a greater or less extent: none of them shows the slightest tendency to pass from one to another. So far at least as the Lower Provinces are concerned, the existence of anything in the nature of a form intermediate between *Eai* and *Sarson*, *22k*, and *Tori* or even between the more closely allied *Sarson* and *Tori* is wholly imaginary. more closely allied *Sarson* and *Tori*

Still the idea that such intermediates should exist is not altogether inexplicable. Examples of the same form sent from different districts may bear any of the three names given above, while the differences between flowering examples *oiSo/rson* and *Tori*, with the leaves still attached, and between fruiting examples of *Tori* and *Rai*, whence the leaves have fallen, are much less salient in herbarium specimens than in the living plants. Aⁿ where three specimens of one form may be submitted for examination from three different districts under as many different native names, along with three specimens of different forms from still other districts, but with the same native name given for each, it is not to be wondered at that it should have been supposed, by more than one author, that the various forms at times pass into one another. It is hard to realize that vernacular names applied by the natives themselves are not merely worthless for purposes of comparison, but may, if relied on, be highly misleading. Such, however, is the case; although often, perhaps indeed usually, rigidly enough applied within a given district or group of districts, native names are worse than useless when they depended on to yield information regarding another group of districts. And yet it is inexpedient, indeed in the present instance it is impossible, to dispense with the use of native names. It is a safe general rule, when precision is desired, to use, in referring to any plant, what is termed its scientific name. There are, however, occasions, and this is pre-eminently one of them, when systematic botany is fallible. The scientific names of our Indian mustards, besides being, in some cases, cumbersome and clumsy, are in every case, even more likely to mislead—were such a thing possible—than the native names themselves. For, besides the difficulties that later writers have experienced in differentiating the

crops of Bengal.

mustards—many of these difficulties, it may be said in passing, -would never have arisen if more reliance had been placed by his successors on Roxburgh's judgment—there are difficulties of another kind to contend with. These have arisen from the attempt to identify the various Indian mustards with European cultivated forms—an attempt which, it is to be feared, has hardly been more successful than the attempt to distinguish the mustards themselves.

The difficulties of this problem can only be satisfactorily settled by the simultaneous culture of all the Indian and all the European kinds and by a careful comparative study of the various forms at every stage of growth. Nor will this study be effective without simultaneous culture and study of the Chinese kinds among which, the writer is inclined to believe, will be found the stocks whence European and Indian forms alike have been derived. To describe the Indian mustards, and yet make no suggestion as to their probable affinities, would be obviously to avoid a portion of the task incumbent on the taxonomic botanist: in the accounts of particular mustards that follow, the writer has therefore expressed the opinion he is inclined to hold as to the probable general relationships of each. But as regards certain details, he asks for the right to retain an open mind, and he ventures to suggest to others the advisability of doing the same.

It is doubtless convenient for the District or Settlement Officer to speak or write of a particular crop as "Mustard," "Colza," or "Rape;" the names are familiar, and convey a fairly definite idea. It would, however, be safer to qualify the terms by speaking of the plants as "*Indian Mustard*," "*Indian Colza*," "*Indian Rape*"—safer still, provided the three crops can be recognisably described, to speak of them simply as "Rai," "Sarson," and "Tori," respectively, and, as far as possible, to avoid the use alike of the European popular and scientific names.

fiat, or Indian mustard, there is not any doubt, is the plant that Roxburgh has described as *Sinapis ramosa*, and that Hooker and Thomson have described as *Brassica juncea*. But in their original paper, published in the Linnean Society's *Journal*, the native name and the note as to the qualities of the plants—though in each case the name and note are quite accurate—have been transferred from *Rai* to *Sarson*, and *vice versa*. The botanist has, of course, merely to read the technical descriptions of the plants to detect the transfer of the notes; but the result has been that every *non-botanical* consultant of the paper in question has gathered

Inadvisability of using

that the scientific name of *Rai* is *Brassica campestris*, and that *Brassica juncea*, which really is the name of *Rai*, is the name of *Sarson*.

Then, *Sarson* and *Tori* are certain to be misunderstood if their scientific names are used. Both are, as a rule, referred to *Brassica campestris*; and though no one who has ever seen the two plants growing side by side will venture to say that they are the same thing, it is not unusual to find them treated in botanical works as merely different varieties of one particular sub-species of *Brassica campestris*. Roxburgh, who knew the two crops, treated them as distinct species, naming the former *Sinapis glauca*, the latter *Stnapis diehotoma*. But Roxburgh, usually so accurate, has somewhat confused the names of the two : he gives the name of the first as *Shwet Rai* (white mustard), of the second as *Shanshi* or *Skorshi*. This is exactly what the two *are* called in Central Bengal, and so far, therefore, all is well. But he gives the Hindi term *Sarson* as the equivalent of the Bengali *Shorshi*, and applies it therefore to *Tori*. This precisely reverses the actual usage. The name *Sarson* is *never* applied to the plant that in Central Bengal is termed *Sarisha* (or *Shorshi*, as Roxburgh spells it), but always to the plant that in Bengal is termed *Shwet Rai*. Roxburgh's third name for *Tori* is *Sada Rayee*,—a mere *lapsus calami* for *Sadharan*, which has escaped the notice of the editor of the volume.

The nice academic questions involved in deciding what constitutes a species, sub-species, or variety are fitly discussed in monographs of natural families. But in notes like the present, purely economic in scope, such refinements tend only to confusion. Wheⁿ the layman, in the course of business or duty, is brought face to face with two plants so dissimilar in appearance, mode of growth, time of ripening, and method of cultivation, and so completely wanting in anything of the nature of intermediate forms, as *Sarson* and *Tori* are; and when, on turning to a botanical work, he find^s it stated that they are the same thing, or at most only different varieties of the same thing, he is apt to wonder at systematic botany. Even if he appreciates the precise meaning of the expression, it is too much to expect that he shall care to write or speak of *Brassica campestris*, subsp. *genuina*, var. *glauca*, and *B. campestris*, subsp. *Napus*, var. *dichotoma* when he can use the terms *Sarson* and *Tori* instead. Indeed, it is well for all concerned to cultivate this frame of mind, for to follow the botanical arrangement accorded to these mustards is trying either to reason

the scientific names of the Mustards.

or to faith. Systematic botany, not content with first denying that *Tori* and ordinary *Sarson* differ, insists that *JJlti Sarson*, which is unlike ordinary *Sarson* only in having pendent pods, is a separate species (*Brassica 3-ocularis*), and further declares that if the pods of ordinary *Sarson* have 4 rows of seeds instead of two, it constitutes still another species (*B. 4-valvis*) ; statements that amount to declaring two equal and similar parts to be, if taken conjointly, rather less, if taken separately, each of them greater than the whole.

On account of the confusion just outlined, and it may be remarked that this sketch is far from exaggerating the tangle that exists, the writer has given an altogether subordinate value to the scientific names of the plants, and has employed the leading vernacular ones to designate the various mustards themselves, regarding which, *as plants*, no doubt is possible.

The present note does not deal with the mode of cultivation, acreage under crop, outturn of, or trade in, the mustards and their oils in the various parts of the Lower Provinces. It deals merely with the botanical characters of the various mustards; the relationship they bear to each other and to the names applied to them throughout Bengal. Plates are given in illustration of the mustards, and maps are employed to explain the distribution of the kinds and of the names used to designate them.

Besides the examples of *Rai*, *Sarson*, and *Tori*, of which the "writer has had respectively 46, 45 and 48 plots under cultivation, there were two others—one from Ghittagong and one from Kalimpong in British Bhutan—that proved quite distinct from any of the three, and that call for separate description.

One of these—the Kalimpong *Rai*—possessed the great interest of being *Sinapis rugosa*, a Roxburghian plant that has been lost sight of since Roxburgh described it, and the writer accordingly invoked the assistance of Mr. Pantling, First Assistant of Cinchona Cultivation in British Sikkim, in a search for still another mountain mustard—that described by Roxburgh as *Sinapis cuneifolia*, which has been equally lost sight of and which the Department of Land Records and Agriculture had not communicated. The search did not result in the re-discovery of *S. cuneifolia*, but was the means of disclosing yet another form most nearly allied to, but quite distinct from, *Tori*. Hardly had this information been received from Sikkim when Dr. Watt, Reporter on Economic Products to the Government of India, returned

Botanical account of **the**

from an official tour in North Bengal with the interesting information that the cultivation of what is perhaps the lost *Sinapis cuneifolia* prevails throughout the area occupied by the populations of Cachari or Rajbansi origin, *i.e.*, throughout Northern Bengal and in the valley of Assam. Then, no account of the mustards cultivated in Bengal could be deemed complete that left out of consideration the "China cabbage," if for no other reason than that a recent order enjoins its compulsory cultivation in Jail gardens.

Neither the 'black' nor the *white' mustards of Europe are grown as crops anywhere within the limits of the Lower Provinces. No description, therefore, is given of either of those kinds. Since, however, they may occasionally be met with in the gardens of the curious, and as both should be familiar to officers of European experience, a place has been given to them in the Key.

SECTION H.—BOTANICAL ACCOUNT OF **THE** MUSTARDS OF BENGAL.

The mustards belong to the genus *Brassica* Linn , of the natural order *Cruciferae*, one of the most important genera in the vegetable kingdom, including as it does the varied forms of Mustard, Rape, Colza, Turnip and Cabbage. The present note does not deal with the Cabbage or the Turnip, both of which are quite exotic in the Lower Provinces, and only treats exhaustively those Colzas, Rapes and Mustards that form staple field or garden crops within the area under the rule of the Lieutenant-Governor of Bengal.

Following a brief technical description of the genus will be found a key to the species in this area. This key, in turn, is followed by a more detailed account of each of the species, varieties, cultivated races, and special forms to be met with in Bengal, the geographical distribution of each by districts and the names borne by each in the different districts being added. In arranging these districts it has not been found advisable to adhere to the present political divisions of the Lower Provinces. However convenient these may be from the administrative point of view, they do not always accord with natural facts. The deviations, however, have not been very great. They consist mainly (a), of the subdivision of Bihar into (1) Tirhut, north of the Ganges but not passing east of the Kosi, and (2) South Bihar, between the Ganges and Chota Nagpur; and (b), the subdivision of Bengal Proper into three parts, *otr.*, (1) West Bengal,—the Burdwan and Presidency Divisions; (2) North Bengal, — the country east

Mustards of Bengal.

of the Kosi, north of the Ganges and west of the Brahmaputra ; and (3) East Bengal,—the Dacca Division. Eight more or less natural areas are thus obtained, viz., Tirhut, South Bihar, Cliota Nagpur, Orissa, West Bengal, North Bengal, East Bengal, and Chittagong. In giving the distribution of the various mustards the regions are noted in the above order.

BBASSIGA LINN.

THE MUSTARDS, RAPES, TURNIPS, AND CABBAGES.

Annual, biennial, or perennial herbs, either smooth or with stiff or rough hairs; the lower leaves usually deeply pinnate or lyrate, the upper ones often entire; the flowers yellow. *Pod* linear, cylindrical, or nearly so, more or less beaked at the top beyond the end of the valves: the beak consisting either of the conical style alone or including a portion of the pod itself, and then often with one or more seeds in it. *Seeds* globular, ovoid, or somewhat flattened; the seed-leaves folded longitudinally over the radicle.

A genus including 160 different forms, many of them, however, merely varieties evolved or races fixed under cultivation; the actual number of species probably not more than 80-90. The genus is a native of North Temperate regions, with apparently two centres of origin—an Oriental-Mediterranean and a Chinese. Under cultivation some of the forms reach, as cold-season crops, sub-tropical and even tropical districts.

There is only one Indian species that is not given in the sub-joined key; it is excluded because it does not occur within the limits of Bengal. This species, *Brassica Tournefortii* Oouan, is a member of the group that has originated in the Oriental or Mediterranean areas; it is stated to have been once found in the semi-desert country between Ajmir and Delhi, and is, according to Edgeworthb, cultivated in Western Tibet. From these points it extends westward to Italy and Spain, but it does not come farther towards the East.

White Mustard.

"black mustard" is an article late of introduction into India; the fact that the Persian form of the general name (*Sārshaf*, the name by which it is known in Indian hospitals), is the only Indian term that is at all distinctive, helps to support this conclusion. But it does not necessarily follow from this, as some are inclined to think, "that the ancient Sanskrit writers had not seen the true black and white mustard, and that the word *rdjkd* may have originally denoted a form of *Brasnea juncea* and the word *siddhrtha*, a form of *J5. campestris*" (Watt, *Diet. Econ. Prod.*, i. 532). Dr. Watt adds:—"Now-a-days these names are chiefly applied to the true black and white mustard—*JB nigra* and *B. alba* respectively." As regards the latter statement, the facts in Bengal are widely different. The Sanskrit *siddhrtha* in the Lower Provinces connotes *Qveta* or white-seeded *Sarson*, while *rajihd* connotes *Rdi*. As regards the former* the conclusion to which the facts of the case would lead seems also precisely the reverse. If the Sanskrit-using races entered India by the north-west, they must have done so through regions where both the black and the white mustards still grow, but eastward from which neither form has yet extended. There is every indication that both *Rdi* and *Sarson* are immigrants from China by a north-eastern route and that their arrival has been independent of any Aryan inenrsion. Nothing, then, is more probable than that in *Rdjkd* and *Siddhrtha* we really have Sanskrit terms *originally* applied to the black and white mustards respectively; afterwards transferred, as the language and those who used it passed eastward, to plants in the new region more or less representative of those that bore these names in the abandoned one.

B.-WHITE MUSTARD.

BRASSICA ALBA BOWS. *Voy. Espagne*, ii. 39 |*E. f. Sf T. Fbr. Brit. hid.*, i. 157 ; *Watt Diet.*, i. 521.

Sinapis alba *Linn. 8p. PL*, 668; *DG. Prodr.*, i. 220.

S. foliosa *Willd. Enum.*, 668; *DO. Prodr.*, i. 220.

For this also Dr. Watt gives a large number of vernacular names; that quoted as the Bengali equivalent is *Dh6p-rdi*. As will be seen under *Sarson*, this name is exclusively applied to a form of that plant, and never apparently to *B. alba*, which, as a matter of fact, was not sent from any part of the Lower Provinces.

This appears to be even rarer in India than black mustard.

Cabbage Mustard.

C.—PASAI, PALANGI, OR PAHARI RAI; BADISHA LAI, OR BHOTIYA LAI.

BBASSICA RUGOSA *Train.* [B. rugosa VAR. typica *Pram.*]

B_# juncea *H. f. & T. Journ. Linn. Soc.*, v. 170; *Flor. Brii. Ind.*, i. 157 in part; excluding the RAI plant and also excluding *Sinapis cuneifolia Roxb.*

B. chinensis *Duthie & Fuller, Field and Garden drops*, ii. 34, not of *Linn**

[B. dentata, *Watt Mss.* (B. rugosa VAR. agrestis *Pram.*)]
Sinapis rugosa Roxb., Hort. Beng. 48; *Flor. Ind.*, iii. 122.

Moutarde de Chine à feuille de Chou—*Vilmorin, Les Plantes potagères*, 356.

A cold-weather crop in the Western, Central, and Eastern Himalaya of annual herbs with very short stocks till the plants begin to flower, and with permanent radical leaves, forming a loose cabbage-like head, one foot across, resembling the head of a *' Leaf-Beet' or a " China-Cabbage," afterwards ' shooting' into a tall, stoutish stem 4-6 feet high, its branches ascending to form a narrow pyramidal head 6-10 in. across. *Root* slender, tapering, 6 in. long. *Leaves* very large, the blades of the basal, cabbage-forming ones, which are disposed in a condensed spiral, 12-15 in. long, 8-9 in. wide, obovate obtuse or subacute, when young hirsute above, the anterior half-margin toothed, the posterior much lacinate and tapering to a stalk 3-4 in. long, 1-1*5 in. wide, thick, white and fleshy, continued into the leaf as a broad, white fleshy main-nerve with longitudinal ridges and weak bristles beneath, and breaking fan-wise beyond the middle into many slender white sub-equal veins, the blade proper bright green, and without bloom. *Stem* branching, as soon as it shoots, from the axils of all the leaves above those of the stock; the stem-leaves similar to the basal ones but smaller, decreasing upwards, all without stalks and never stem-clasping; the branches also leafy, but more slender and shorter than main stem, their leaves smaller and less lacinate towards base, sub-acute at the tips, and with again smaller branches in their axils. *Flowers* in short corymbs, about 1*5 in. long when the lowest flower opens, subsequently elongating into racemes 8 in. long, with equal slender stalklets *6-7 in. long, slightly spreading, but not elongating in fruit, without bracts or bractlets.

Cabbage Mustard.

Sepals slightly spreading, .2 in. long, .08 in. wide, still green at time of falling. *Oorolla* .6 in. across, petals with a pale-green, narrow claw .12 in. long, and a bright-yellow, spreading, regularly obovoid blade .25 in. long and .2 in. across, faintly greenish-veined beneath. *Pods* 2-valved, including the beak 1.25-1.5 in. long, .2 in. thick; beak narrowly conical, .25 in. long; valves convex, rigid, thinly leathery, faintly beaded opposite the seeds, with a strongish midrib prominent outside, and with rather distinct looped veins on each half-valve. *Seeds* 7-10 under each valve, spherical, brown, finely rugose, like the colour of the remainder of the testa; cotyledons yellow.

DARJEEMING DISTRICT : Kalimpong (*Rdi*)! Rungbee, etc., 2-6,000 feet (*Pasdi*, *Palangi* or *Pahari Rdi*) !

The cultivation of this plant appears to be usual in Nepal, whence Buchanan-Hamilton sent seeds of it to the Calcutta Botanic Garden in 1802. Hamilton informed Roxburgh that the seeds came from Tibet; Nepalese settlers have carried the plant westward along the Himalaya to Kamaon, and eastward to British Bhutan. This mustard is well described and figured by Vilmorin as "Chinese cabbage-leaved mustard," and it is not impossible that a Chinese plant referred to by Forbes and Hemsley as a variety of *B. juncea* (*Journ. Linn. Soc.*, xxiii. 47), which is "cultivated in immense quantities, and after drying in the sun is pickled and eaten with rice," may be the same. It is, however, just as likely to be the next one.

This, Mr. Pantling notes, is cultivated both as a vegetable and in order that oil may be extracted from the seeds. When left alone it forms a fine loose cabbage exactly as in Vilmorin's figure, reproduced in PLATE I (fig. 1). It is an early weather crop in the hills, and is grown more for the leaves than for the seeds. The leaves are plucked almost as fast as they are developed, so that by the time the flowers are produced, none or next to none remain on the stems.

As regards the systematic position of this plant, the writer agrees with Hooker and Thomson in deeming it a member of the group of forms to which *B. juncea* (*Asl-Bdi*, or "Indian mustard") belongs. But it is impossible to assent to its reduction, unless as a sub-species, to *B. juncea*. It is, as we know, highly probable that India owes *B. juncea* (the *Asl-Bdi*) to China, and it seems likely that the route followed by the *Asl-Rdi* on its way to Bengal and Upper India has been that across the north-east frontier and along the valley of Assam. At all events the «agrestal» plant named *Sinapis patens* by Roxburgh, which, though quite wild, is nevertheless not



BRASSICA RUGOSA, Frain.
 SINAPIS RUGOSA, Roxb.

Lith. by A. C. Mukerjee.

Cabbage Mustard.

botanically separable from his *S. juncea*, is far commoner along that route than it is in the plains of India.

But *B. rugosa*, if it be a derivative of the stock from which *B. juncea* has originated, is a derivative of long standing. Not only has it probably originated in China and been introduced in its present form to the Central Himalayan region through Tibet, in India, at all events, it shows no inclination to revert to a form approaching *B. juncea*. On the contrary, we are indebted to Dr. Watt for the interesting discovery that in Manipur there is an "agrestal" plant, for which he has proposed the name *B. dentata*, which, though quite wild, is not botanically separable from Roxburgh's *Sinapis rugosa*, and which we cannot by any stretch of the imagination identify with Roxburgh's *Sinapis juncea*. In other words, *B. rugosa* cannot be included in *B. juncea* even as a separate variety. It constitutes what may be termed a species of secondary rank, or a sub-species, according to the standpoint from which the problem is viewed. In a monograph of the genus *Brassica* it would doubtless be sufficient to treat *B. rugosa* as a sub-species related to *B. juncea*, precisely as *B. Napus* and *B. Bapa* are related to *B. campestris*. In a note like the present it is obviously better to treat it, just as if *Napus* and *B. campestris* are treated, as a distinct species. The precise relationship is shown in the systematic conspectus that follows this chapter.

The most interesting feature about *B. dentata* Watt (*B. rugosa* VAR, *agrestis*), is that it combines exactly the foliage of true *B. rugosa* with a somewhat different habit of growth, the root leaves forming a rosette rather than a cabbage.

EXPLANATION OF PLATE I.

BRASSICA RUGOSA Prain.

(*Sinapis rugosa* Roxb.).

1. Plant before flowering, about -8, after *Vilmorin*.
2. Portion of stem after flowering has commenced, with stem-leaf, J; *reduced from Roxburgh's original drawing.*
3. 4. Portions of a flowering branch, \; *from Roxburgh's original drawing.*
6. Unripe capsule, \; *from Roxburgh's drawing.*
6. #Ripe capsule, \; *from Roxburgh's drawing.*
7. Seed; enlarged j *from Roxburgh's drawing.*

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D.—LAHI SAG.

BRASSICA RUGOSA TAR. CUNEIFOLTA *Prain*.

B. juncea *H. l. fy T. Journ. Linn. Soc*, V. 170; *Flor. Brit. Ind.*, i. 157, *in part; excluding the ASL-RAÍ plant and also the synonym Sinapis rugosa Roxb.*

Sinapis cuneifolia *Roxb. Sort. Beng.* 48; *Flor. Ind.*, iii. 122.

A cold-weather garden crop in Northern Bengal and in Assam of annual herbs with tall much-branching erect stems 4-6 feet high, the branches ascending to form a wide pyramidal head 1*5-2 feet across. *Root* stout, swollen, 6-8 in. long; *Leaves* large, the basal ones soon withering, their blades 12-15 in. long, 4-6 in. wide, obovate, the point subacute, tapering from beyond the middle to a stalk 2 in. long, ^a35 in. wide, channelled above, not ridged, continued into the leaf as a slender tapering midrib, giving off at intervals 10-12 pairs of lateral nerves, glabrous above even when young, with very few bristles beneath, the blade proper glaucescent, the margin finely serrate. *Stem* branching from the axils of the 4th or 5th leaf upwards, these stem-leaves similar to the basal, but smaller, decreasing upwards; all without stalks, and never stem-clasping; branches always leafy, nearly as strong and long as main stem, and often again branching; stem and branches with a slight bloom, and more or less tinged with purple, especially near the nodes. *Flowers* in short corymbs, about 15 in. long when the lowest flower opens, subsequently elongating into racemes 5-6 in. long, with equal slender stalklets 4*5 in. long, slightly spreading but not elongating in fruit, without bracts or bractlets. *Sepals* slightly spreading, *2 in. long, '08 in. wide, still green at time of falling. *Corolla* '5 in. across, petals with a pale-green, narrow claw ^s15 in. long and a bright* yellow, spreading, suborbicular blade *2 in. long and broad, very faintly veined. *Pods* 2-valved, including the beak 1*25-1*5 in. long, '2 in. thick; beak narrowly conical, '25 in. long; valves-convex rigid, thinly leathery, faintly beaded opposite the seeds, with a strongish midrib prominent outside, and with rather distinct looped veins on each half-valve. *Seeds* 7-10 under each valve, spherical, brown, finely rugose; *liilam* the colour of the remainder of the testa; cotyledons yellow.

Like the preceding, this was sent to the Calcutta Garden from Nepal by Buchanan-Hamilton in 1802, and, as in the other case (so at least, Roxburgh notes) Hamilton got

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the seeds from Tibet. However, there is no trace of the cultivation of this kind among the Nepalese settlers in the Eastern Himalaya at the present time, and there is just the possibility of some mistake as to the locality whence the seeds came, because this appears to be one of the staple crops in Dinajpur, Rangpur, and Bogra—districts that were carefully economically surveyed by Buchanan-Hamilton at the beginning of the century, and whence it is possible the seeds may have been obtained. Its cultivation also extends, Dr. Watt finds, into the valley of Assam, and if limited to, seems to be co-extensive with, the area occupied by races that are of a Cachari, or, as in North Bengal they are usually termed, a Rajbansi stock.

It is a garden, not a field, crop. This may explain why the Department of Land Records did not communicate seeds. Dr. Watt's field-notes describe the cultivation of the plant and the use of its leaves in terms identical with those used by Mr. Pantling in describing the culture and use of *B. rugosa*.

This plant, Roxburgh's *Sinapis cuneifolia*, has been reduced, like the preceding, by Hooker and Thomson to *Drassica juncea*. It is nearest, of the Indian forms, to *B. rugosa*; the flowers and fruits and seeds are practically identical with those of *B. rugosa*, and differ, especially the fruits, rather markedly from those of *B. juncea*. But the swollen root, the glaucescent stem, and the rather smaller petals seem to indicate that this is at least varietally separable. No agrestal form of this, corresponding to *B. dentata* or *B. patens*, has been met with as yet.

Hooker and Thomson, and again Forbes and Hemsley (*Journ. Linn. Soc.*, xxiii. 47) have reduced *Sinapis chinensis* (Linn.) to *B. juncea*. Duthie and Fuller, on the other hand, identify *S. chinensis* (Linn.) with *Badisha Bâi*, which is *S. rugosa* Roxb.; this, in spite of Hooker and Thomson having reduced *S. rugosa* to *B. juncea*, is not quite the same thing. The matter must be left for the present as somewhat doubtful. Linnæus and Willdenow both state that *Sinapis chinensis* has small *white* flowers; either reduction must therefore have been put aside as 'suspicious,' were it not for the fact that De Candolle notes (*Prodr.*, ii. 219) having actually seen a specimen of *S. chinensis* in the Paris Herbarium, and says that its flowers are very like those of *S. juncea*. If one or other of the reductions be necessary, it seems as if that proposed by Hooker and Thomson, not that proposed by Duthie and Fuller, must be the correct one. In any case, even if the identification indicated by Duthie and

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Fuller could be sustained, the name *Brassica chinensis* proposed by them is not available. There is already a different *Brassica chinensis* Linn, (the China Cabbage), older as a name than the -same author's *Sinapis chinensis*.

EXPLANATION OF PLATE II.

BRASSICA EUGOSA var. CUNEIFOLIA Frain.

(*Sinapia cuneifolia* Roxb.)

1. Radical leaf, |; *reduced from Roxburgh's original drawing.*
- 2, 3. Portions of a flowering-branch, |; *from Roxburgh's drawing.*
4. Flower, |; *from Roxburgh's drawing.*
6. Unripe capsule, |; *from Roxburgh's drawing.*
- G. Ripe capsule, |; *from Roxburgh's drawing.*
7. Seed, enlarged j *from Roxburgh's drawing.*

E.—ASL-R^r OR INDIAN MUSTARD.

BRASSICA JUNCEA *H. f. fy T. Journ. Linn. Soc, v. 170; Flor. Brit. Ind., i. 157; Forbes & Hemsl. Journ. Linn. Soc, xxiii. 47; Duthie & Fuller Field and Garden Orops, ii. 33; Watt Diet., i. 528.*

Sinapis juncea Linn. *Sp. PL* 668; *BO. Prodr., i. 2J8; Franch. PI David, i. 40.*

S. ramosa *Boxb. Bort. Beng., 48; Flor. Ind., iii. 119.*

S. chinensis Linn. *Mant. PI. 95 j Arduin, Sp., i. 23, t. 10; DC. Prodr., i. 219, not Brassica chinensis Linn.*

S. patens *Boxb. Eort. Beng., 48; Flor. Ind., iii. 124 (Brassica juncea VAR. agrestis Prain).*

A cold-weather crop in the plains and in the lower Himalaya of tall, annual, much-branching erect herbs 3-6 feet high, the branches ascending and forming a wide pyramidal head 1-1*5 feet across. *Boot* slender, tapering, 6 in. long. *Leaves* large, the blades of the basal 6-8 in. long, 2-4 in. wide, sinuate-lyrate, tapering to a stalk 1-2 in. long, decreasing upwards, those in the upper third of the stem 2-2-5 in. long, -5 in. wide, with entire margins, bright green and without bloom. *Stem* branching from the axils of the 4th or 5th leaves upwards, all branches about as long as continued main stem and often again branching, usually more or less tinged with purple, especially near the joints; the leaves after branching commences oblanceolate with



BRASSICA RUGOSA Var. *CUNEIFOLIA* Frain.
SINAPIS CUNEIFOLIA Roxb.

Chitra. Silpi C^o

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an acute tip and a narrowly cuneate base, gradually tapering backwards from the middle. Flowers in short corymbs about 1 in. long when the lowest flower opens, subsequently elongating into a raceme 8 in. long, with equal slender stalklets '6-7 in. long, without bracts or bractlets, slightly spreading and increasing, as the fruit ripens, to 2 in. in length. *Sepals* slightly spreading '2 in. long, '08 in. wide, green, becoming yellowish, before falling. *Corolla* '6 in. across; petals with a pale-green, narrow claw *12 in. long, and a bright-yellow, spreading, regularly obovoid blade #25 in. long, '2 in. across, faintly greenish-veined' beneath. *Pods* 2-valved, including the beak 2 25-2*5 in. long, •2 in. thick; beak narrowly conical, *4 in. long; valves convex, rigid, thinly leathery, distinctly beaded opposite the seeds, with a straight strong midrib, prominent outside, and with rather strong prominent looped veins on each half-valve. *Seeds* about 20 under each valve, spherical, brown, finely rugose; hilum the colour of the remainder of the testa; cotyledons yellow.

There are three more or less distinct forms of *Asl-rod* cultivated in the Lower Provinces. They are quite easily distinguished when growing side by side, but the characters are not very tangible except in the living plant, and are certainly not of varietal, perhaps hardly even of racial value. The forms are—

1. TALL LATE RÁI; genuine *Rái*, *Leaves* near base of stem with a few hairs beneath, upper with none. *Stems* 5-6 feet high; fruit *ripening* about middle of February.

Cultivated generally throughout the Lower Provinces; samples have been received from Tirhut, South Bihar, Orissa, Western, Northern and Eastern Bengal. No sample has been sent from Ghota Nagpur or from Ghittagong.

2. ROUGH EARLY' RÁF. *Leaves* all more OF less hairy beneath. *Stems* 3-4 feet high, green or very faintly purple; fruit *ripening* in beginning of February.

Cultivated fairly generally in the central part of the Lower Provinces. Samples have been received from South Bihar, Western and Northern Bengal: none have come from Tirhut, or Chota Nagpur, or Orissa, and none have been sent from East Bengal. One sample was sent from Chittagong, but it is apparently a* recently introduced plant in that district (*see* next paragraph).

3. SMOOTH EAELY RÁI. *Leaves* all quite destitute of hairs beneath. *Stems* 3-4 feet high, more darkly purple than in the other two forms; fruit *ripening* in beginning of February.

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Much more limited even than the preceding, though apparently fairly commonly cultivated in Tirhut, South Bihar, and Western Bengal. It appears to be unknown in North and East Bengal and in Orissa, and practically unknown in Ghittagong, for the only sample sent from that district was a mixture of this and of " Bough early. " It is also practically unknown in Ghota Nagpur, the only sample sent from that Division being a mixture of this " Smooth early " form and of *Sarson*.

As a whole, *Rái* may be said to be a general crop everywhere in the Lower Provinces, except Ghota Nagpur, where it is practically unknown, and Ghittagong where it may have been only recently introduced. The explanation doubtless is that in Ghota Nagpur *Tori* (there termed *Lutni*) replaces *Rdi*; in Chittagong *Asl-Rdi* appears to be replaced by a special mustard peculiar to the district.

In the *Hortus Bengalensis* Roxburgh gives *Juni-rdi* as the vernacular name. It is interesting to find, eighty years afterwards, that this name is still used within twenty miles of the Royal Botanic Garden ; it is, however, curious that the name is not reported from any but the Hooghly district. Roxburgh has written the name *Juni* also on the figure of *Sinapis ramosa* in his *Icones Ineditse*, with the later additional note:—" The same came up equally with the Purneah *Toree*." By the time the manuscript of the *Flora Indica* was prepared, Roxburgh had, however, ascertained what the facts of the case really were, and uses for his *Sinapis ramosa* its true name *Rdi*.

By an accident already alluded to, the notes stating the native names and qualities of *B. juncea* and *B. cnmpestris* have been transposed in Hooker and Thomson's original account of the Indian *Brassicæ*, much to the discomfiture of non-botanical consultants of the paper.

Sinapis patens Roxb., properly given as *BeeUrdu* in the *Hortus Bengalensis*, by an error of the printer *Keel-rdi* in the *Flora Indica*, is a weed of cultivation in Bengal which Hooker and Thomson refer to *Brassica juncea* in their original paper. In the *Flora of British India*, i. 157, those authors say it is a *Nasturtium*, though they do not account for it under *Nasturtium*. That the first reduction which Hooker and Thomson proposed is a just one seems to be undoubted ; there is not a single essential character by which *S. patens* can be separated from *Rdi*. At the same time, it is (1) perfectly certain that it is not merely *Rdi* springing up in fields from dropped seeds, and it is (2) highly probable that it does not represent the original wild stock whence *Rdi* has

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been derived; it appears to be rather a degenerate subferal escaped condition of the cultivated *Rdi*. One of its most marked peculiarities as compared with *Rdi*, besides its smaller size, is the habit it has acquired of appearing during the rains, though it does not flower till the cold season. The plant does not appear to extend further west than Central Bengal, and even there and in Eastern Bengal it is far from common. In the Khasia, the Naga and the Kachin Hills, however, it is of quite frequent occurrence: there it flowers from March to May. It is probable that the *Sinapis chinensis* of Linnaeus and of Arduin is this particular form.

The writer therefore proposes to treat *Sinapis patens* as a distinct retrograde variety of *Rdi*; it may be best known as *Brassica juncea* VAR. *agrestis*. It has already been pointed out that Dr. Watt has discovered in Manipur a similarly distinct retrograde variety of *Brassica rugosa*, occurring in fields as a weed of cultivation.

The detailed distribution of the three forms of *Asl-rdi* cultivated in Bengal, as shown by samples sent to Sibpur, is given in the subjoined table along with the names that accompanied such sample. The general distribution is indicated in MAP I, SECTION A. The following special remarks are called for in connection with this list:—

The sample sent as *Rdi* from Singbhum was a mixture in almost equal parts of *Rdi* and *Sarson*. Only one other sample was sent as *Rdi* from any part of Ghotia Nagpur. It came from Hazaribagh; it proved to be *Tori*, not *Rdi*.

The "small *Rdi*" of Chittagong, of which only one sample was sent, consisted of about equal parts rough and smooth short *Rdi*. They ripened, however, rather later than any of the plots of either kind, and were about as 'late' as the tall *Rdi* of the first column. The *Rdi sarisha* of Midnapore was also a mixture of the two short forms. Both, however, ripened early. Another sample from Midnapore of clean 'short, smooth, early' had a distinctive name. The term *chota*, applied to the sample from Orissa, had reference to the seeds, for the *bara sarisha* from Angul was a form of *Tori*, a much smaller plant, but with larger seeds.

The seeds of the plants grown in the Sibpur Farm were very uniform in all the samples, whatever the district of origin. They were in every case rather smaller than the original seeds supplied from Tirhut or South Bihar, but not than those sent from Bengal Proper and Orissa.

DETAILS OF SAMPLES OF *UAI*

Cultivated at Sibpur Experimental Farm, 1896 97.

	Tall, slightly rough, late	Short, rough, early	Short, smooth, early.
TIHUT	Baran <i>Sat or Lah%</i> <i>Raxure i</i>		Darhhanpa N. Bhagalpur (Supaul) <i>Ton'</i> <i>Matehi Edt ></i>
S BIBAB.	6hahabod (Bhujptr) <i>Bat I</i>	Shahabad (Bhujpur) <i>Lalhi Ton'</i> ,, (Arrah) <i>Dtarah Ba%</i>	Shahabad ((Bhujpur) <i>Langn'</i> ,, Arrah) <i>Lotni Edi'</i>
	Patna <i>Sdt</i>	Ga>a <i>Hat</i>	
	Monghyr <i>Qota or Tort I</i>		
CHOTIL NAGPUB			[Singhbhum (see note) <i>Bat'</i>]
Oaxesi	Angul <i>Chota tarttha *</i>		

Details of *Rds*

W BUTOAL

Sonthal Parganas *Sdt I*
 Hughli (Serampore) *Xala aartaha'*
 „ (Jahanabad) *Jhunt'*
 Jessore *Bat t*
 „ *Afaght aartaha f*

fionthal Parganas *<7oM'*
 Btnkura *Zotni'*
 Mi Inipore *Sat »at t>ha **
 24-Parganas *Kazh aat taha'*
 Pnrneah *Eat '*
 Jalpaiguri (DevlganJ) *lidt aartaha*
 Murshidabad *Taro aartaha*

Sonthal Parganas *Hon aartaha*
 Midnapore *Morta aartaha*
 Nadia *Bat*

N BJUH}JA»

Parneth *Batchl/*
 J-vl paiguu (Phulkota) *J»» /*
 Binsrpur *Sat aartaha'*
 R-v-l-hah *Rai t*
 Aii'dah *Sat/*
 Pabna *Sat/*

Burdwan *JRdt **
 M *Mif or Maght'*

fi BairOAS*

Dacca *Jtattaruhat*
 Firidptr *Sat am iaha/*
 Alymecsng h fSadar) *Rai aartaha/*
 M Jama pnr; *Lt aarnha'*
 „ (Nttiakc a) *If094 rtxiruAa/*
 Backergange 1H biganj) *Bat ten nha'*
 M (buinaai) *Kalaaansha/*

Tippera *Sat aartaha'*
 „ *2toghlat aartaha I*

[Uanzantabeil *"Small ' Bait]* [Ranzan tahsil *" Small "Ea%"*

CKITTACK»e

am at Sibpur.

Colza.

EXPLANATION OF PLATE III.

BRASSICA JDNCEA Hook. fil. & Thorns.

(Sinapis ramosa Roxb.).

1. Radical leaf, |; *reduced from Roxburgh's original drawing.*
2. Portion of stem with leaf and branch, |; *from Roxburgh's drawing.*
3. Flowering branch, |; *from Roxburgh's drawing.*
4. Fruiting branch, |; *from Roxburgh's drawing.*
5. Capsule, |; *from Roxburgh's drawing.*

F.-COLZA, OR CHITTAGONG "MUSTARD."

BRASSICA GAMPESTRIS Linn. 8p. PL, 666; LG. Syst. Veg., ii. 592
ling. Bot. t. 2146.

B. campestris VAR. oleifera BO. Prodr., i. 214.

A cold-weather crop, only reported from Chittagong, of tall annual herbs 4-5 feet high, branching freely from the axils of the radical leaves in a wide bushy head 2-3 feet across. *Root* stout oblong 6-8 in. long, thickly spindle-shaped, 1-3*5 in. in diameter, fibrous rooted in the lower part, the upper part projecting above ground. *Leaves* large, the radical and those of the lower half of stem lyrate-pinnatifid, 6-14 in. long, the end lobes ovate-cordate 3-4 in. long, 2-3 in. wide, the other lobes along the slender petiole-like main-nerve very small; in the upper third of stem oblong lyrate-sinuate 2*5-3 in. long—all to the very base lyrate and stem-clasping, pale with much bloom on both sides and with some hairs beneath. *Stem* and basal branches subequal all again, freely branched, glaucous and tinged with purple, especially at the joints. *Flowers* in oblong corymbs about 2 in. long, when the lowest flower opens, subsequently elongating into a raceme 8-16 in. long with equal pedicels '75 in. long, slender ascending, in fruit elongating to 1^a5 in., without bracts or bractlets. *Sepals* suberect, inner pair '25 in. long, exceeding outer '2 in. long, all '15 in. wide, glaucous, becoming yellow before falling. *Corolla* '4 in. across, petals with yellow claw '15 in. long and a bright yellow obovate, ascending blade '25 in. long, '2 in. wide. *Pods* 2-valved, including beak 2*25-2-5 ins. long, '2 in. thick; beak slender, conical, '5 in. long; valves convex, thinly leathery, distinctly beaded opposite the seeds; nerves outside rather slender and indistinct. *Seeds* 15-20 under each valve, spherical, bright brown, smooth; hilum the colour of the remainder of testa; cotyledons yellow.

CHITTAGONG : (*sent simply as " Mustard.^{1'} !*)



BRASSICA JUNCEA H. & T.
SINAPIS RAMOSA Roxb.

Drawn by New Guinea, Sipi Co.



BRASSICA CAMPESTRIS L. VAR. OLEIFERA DC.

Emb. by A.C. Mukerjee.

Colza.

This is the only plant among the samples sent to the Sibpur Farm that does not accord with any of the mustards mentioned or described in Indian works on Botany. The sample was a mixed one; the plot produced the above plant, and the more dwarf and early form of *Tori*, in about equal amount. It would almost seem as if mustard cultivation were of recent introduction in the Chittagong district, and it would be interesting to ascertain how it chanced that a plant so like genuine *Colza* should have found its way into Chittagong without reaching Bengal or Bihar.

Though all the Chittagong "Colza"-like plants were annual, flowering freely and producing an abundance of seed, the thick root seemed to suggest that in a more temperate environment they might readily develop, if indeed they had not formerly possessed, the biennial habit so usual in true *Colza*, and so characteristic of the cultivated Navews and Rutabagas, and of the turnips both Swedish and genuine. Indeed, till the moment that the flowering branches began to appear in the axils of its radical leaves, this-Chittagong plant resembled so closely, both in foliage and in root, the corresponding state of the Swedish turnip (*Brassica campestris* VAR. *napo*brassicata*) commonly cultivated in Northern Europe, that the writer was inclined to think some mistake had occurred; a thought that evidently occurred to the overseer of the farm who said that surely this was a *shalgam* (turnip), not a *sarisha* (mustard). So soon as the plant flowered, however, its true nature was apparent. But while admitting it to be no turnip, the native overseer still insisted that the plant was one he had not before seen either in Upper India or in Bengal.

EXPLANATION OF PLATE IV.

BRASSICA CAMPESTRIS Linn. var. OLEIVERA DC.

1. Plant before flowering, about i; from an example cultivated at the Bibpur Experimental Farm, raised from seed received from Chittagong.
2. Radical leaf, } ; ditto.
3. Secondary branch again branching, & ; ditto,
4. Flowering branch, | ; ditto,
6. Flower before fully opening, \$; ditto,
6. Fully-opened flower, half cut away, | ; ditto.
7. Two of the longer stamens, | ; ditto,
8. Young fruit, \$; ditto.
9. Ovule, enlarged; ditto.
10. Capsule, | ; ditto.

Indian Colza.

G.—SARSON, OR INDIAN COLZA.

BRASSICA CAMPBSTRIBIS *Linn.* VAR. SARSON *Train.*

- B. *glauca* *Wittm. ex Hook*, in *Kew Report* for 1877, p. 34.
- B. *campestris* *H.f. fy T. Journ. Linn. Soc*, v. 169, in part.
- B. *campestris* SUBSP. *Napus E. f. # T. Flor. Brit. Ind.*, i. 156, in part.
- B. *campestris* SUBSP. *Napus* VAR. *glauca* *Duthie & Fuller Field and Garden Crops*, ii. 28.
- B. *campestris* SUBSP. *Napus* VAR. *trilocularis* *Duthie fy Fuller Field and Garden Crops*, ii. 28.
- B. *campestris* SUBSP. *Napus* VAR. *quadrivalvis* *Duthie & Fuller Field and Garden Crops*, ii. 29.
- B. *trilocularis* *H. f. & T. Journ. Linn. Soc.*, v. 170; *Flor. Brit. Ind.* i. 156.
- B. *quadrivalvis* *H. / and T. Journ. Linn. Soc*, y. 169; *Flor. Brit. Ind.*, i. 156.
- B. *campestris* SUBSP. *campestris* VAR. *glauca* *Watt Diet.*, u 524.
- B. *campestris* VAR. *glauca* *Kew Bulletin* for 1894, p. 96.
- Sinapis glauca* *Boxb. Sort. Beng.*, 48; *Flor. Ind.*, iii. 118.
- S. trilocularis* *Roxb. Hort. Beng.*, 48; *Flor Ind.*, iii. 121.

A cold-weather crop of tall annual herbs 4-5 feet high, rather rigid and unbranched or branching to form a narrowly pyramidal head 1-1.5 feet across. *Root* thickish, tapering, 6-8 in. long. *Leaves* large, the lower lyrate pinnatifid 6-8 in. long, 2-3 in. wide, decreasing upwards, those in upper third of stem oblong lyrate-sinuate to lanceolate, obtuse or subacute, entire 2.5-3 in. long—all except the lowest 2-3 auricled and stem-clasping, pale, glaucous with at first some hairs beneath. *Stem* rarely branching from the 4th-5th leaf, usually only higher up, branches subfastigate usually shorter than main stem, or stem often unbranched. *Flowers* in oblong corymbs, about 2 in. long when lowest flower opens, subsequently elongating into a raceme 6-16 in. long with subequal ascending slender pedicels 75 in.

Indian Colza.

long, without bracts or bractlets, slightly elongating in fruit, at which time they may be thickened and suberect, or remain slender and become decurved. *Sepals* suberect; inner pair '25 in. long, exceeding the outer pair '2 in. long—all '15 in. wide, glaucous, becoming yellow before falling. *Corolla* *4 in. across; petals with yellow claw '15 in. long, and bright yellow, obovate ascending blade '3 in. long, '2 in. across. *Pods* various; normally '4 in. wide, broader than thick, 2-valved and 2-chambered; in abnormal forms as thick as wide, by lateral expansion of one or both seed-bearing ribs (placentae) spuriously 3-4-valved, and then by absorption, lateral displacement, or doubling of the partition variously 1-, 2-, or 3-chambered; in erect-fruited forms *Pods*, including beak, 2 in. long if 3-4-valved, to 25 in. if 2-valved; in pendent-fruited forms 3-3*25 in. long; beak conical, stout, often 1 in. long; valves thickly leathery, with a weak midrib and indistinct looping nerves on each half-valve. *Seeds* varying from 30-80 in a pod, subspherical, dingy white, yellow or brown, almost smooth, cotyledons pale yellow.

There are three different characters by which it has been* proposed to break up the *Sarson* crop into races, varieties, even species. These are—

- (1) The colour of the seeds.
- (2) The number of valves and chambers in the pod.
- (3) The direction of the stalks when the fruits are ripe.

They are worthy of consideration in detail.

COLOUR OF SEEDS.—In the majority of our Bengal districts only white-seeded forms of *Sarson* are cultivated; this is also the case in Ghotia Nagpur. In most of our South Bihar and Tirhut specimens a certain number of brown *Sarson* seeds are always found, but even in these samples the proportion of white seed greatly exceeds the proportion of brown, which has only in one sample exceeded 15 per cent, of the whole. Among the 143 samples received at Sibpur, only one sample consisted of unmixed brown-seeded *Sarson*. This sample was received from the Dumraon Experimental Farm, and it does not therefore follow that it is cultivated anywhere in our area. So far, then, as Bengal is concerned, the character obtained from colour of seeds is not of practical importance in subdividing *Sarson*. But we have ample proof that the character is of very little real value, for Mr. Duthie has sent to Calcutta examples of a *Sarson* from Kheri in Oudh, where it is known as *Sarson Zard*, in which yellow seeds and ~~White~~ seeds occur on the same specimen!

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NUMBER OF VALVES AND CHAMBERS.—The number of valves, although the character has been used by Hooker and Thomson to separate one form of *Sarson* as a species (*B. quadrivalvis*)* possesses no greater value than the character of colour of seed. Among the 45 plots of *Sarson* cultivated by the writer, 19 were what may be termed *Asl-Sarson* or *Sarson* with pods of the normal *Brassica* type, almost erect, 2-chambered from the presence of a complete partition extending from placenta to placenta, and with only 2-valves, the width of the valves rather exceeding the thickness of the pod. On the other hand, six plots contained plants that had pods very regularly 4-valved, with the partition quite absent (PLATE VII, figs. 2, 7); occasionally pods were found that had a partition present, but only towards one side (PLATE VII, fig. 3), and a considerable percentage of such pods had but three valves owing to one of the two seed-bearing ribs (placentae) remaining normal; a few pods were also found in these plots with three chambers owing to the partition being doubled (PLATE VII, fig. 4). These six plots were the only ones that could be looked on as examples of clean *Brassica quadrivalvis* H. f. & T.

There were four other plots of what at first sight appeared to be unmixed *B. quadrivalvis*, where closer examination showed that while all the fruits at the base and throughout the lower two-thirds of the racemes were 4-valved, and had no partition, those towards the top of the racemes were all 2-valved and 2-chambered, as in normal *Sarson*. Among the plants of this plot, 4-valved and 3-valved pods with laterally displaced partitions (PLATE VII, figs. 3, 4) were far more common than among those of the six plots mentioned in the preceding paragraph. And in one very interesting plot, raised from seed received from Arrah as *Jauda Sarson*, the pods seen from outside looked exactly like those of *Brassica 4-valvis*, since they were as broad as thick, and had the seed-bearing ribs expanded till they were almost as wide as the valves. On being opened, however,—and once the discovery was made, many hundreds of pods from several scores of plants were opened—the pods were in every case found to possess a complete and centrally situated partition with the normal number of rows of seeds (PLATE VII, fig. 6).

Which of the two conditions—that where all the pods are to outward appearance 4-valved, and yet in reality are only 2-valved, or that in which one finds every sort of transition between 2-valved and 4-valved pods—is to be deemed the midway stage in the transition from normal 2-valved to

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specialized 4-valved *Sarson*, and which may be looked on as a reversion from the unnatural 4-valved to the normal 2-valved state must remain an open question. Between them, however, they seem to the writer to prove quite satisfactorily that *B. 4-valvis* has no claim to be considered a separate variety, far less a distinct species.

That the 4-valved state is an abnormal deviation from the type goes almost without saying. Its abnormal nature is, however, corroborated by a tendency that exists to further abnormality. Among the large number of pods examined it was found that, of the pods lowest down in the raceme, about 1 per cent, in those plots where all the pods were 4-valved, and about 2[#]5 per cent, in the plots where the pods were 4-valved below and 2-valved above, afforded examples of the abnormal replacement of one or more seeds by small deformed pods enclosed within the main one (PLATE YIT, fig. 8); and among the many hundreds of pods opened by the writer, one was found that exhibited the much rarer abnormality of an axial accessory pod inside the main pod (PLATE VII, fig. 9); as no such abnormality was found in any of the outwardly 4-valved pods with normal partitions and the usual number of rows of seeds, the writer is inclined to think that these last may illustrate a partial reversion from the 4-valved to the normal type, the other conditions being perhaps instances of the evolution of the 4-valved state.

In six other plots the plants were found to consist of about equal parts of 2-valved and 4-valved erect-fruited *Sarson*. In four of these six plots all the 4-valved plants were true to their type; in the other two the instances of transition from the 4-valved to the 2-valved state were marked and abundant.

The question why, supposing we are right in considering the 4-valved state an abnormal one, our Indian farmers should have in an empirical manner, as the cleanness of many of the samples show, in certain districts consciously or unconsciously selected a 4-valved kind of *Sarson*, while no corresponding kind of *Tori* has been produced, does not seem difficult to answer. The object in the case of any crop grown purely for the sake of its seeds must obviously be to get as much seed as possible. This object, as we shall presently see, has in the case of *Tori* been attained by evolving a plant that branches remarkably freely and widely. In the case of *Sarson*, on the other hand, it has been attained by evolving kinds with pods in which the number of rows of seeds is multiplied. To what extent the custom that almost

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universally prevails of growing *Sarson* along with other crops and of growing *Tori* as a crop by itself is the cause or the effect of the change or of the selection, must be left to others to decide.

The number of partitions, and therefore of chambers, in the pod has been used, at least nominally, in distinguishing still another species—*B. trilocularis*, first separated by Roxburgh and afterwards accepted by Hooker and Thomson. The condition indicated by the name implies the presence of two partitions, and therefore of three chambers (PLATE VII, fig. 11). It is not, however, the rule even in the form to which it gives its name; more often, just as in *B. 4-valvis*, we find in *B. trilocularis* only one partition, towards one side; oftener still we find no partition whatever. But though this is the condition which has given *B. trilocularis* its name, the differentiation of the form known as *B. trilocvXan's* depends in reality on the character next to be considered.

DIRECTION OF THE PODS WHEN RIPE.—The direction of the pods, whether erect or pendent, has been used by Roxburgh, and after him by Hooker and Thomson, as the basis for the separation of another species; *Sinapis trilocularis* Roxb. (*Brassica trilocularis* H. f. & T.) only differs from *Sarson* in having pendulous pods.

Only five unmixed samples of true *B. trilocularis*, with the pods all down-turned and all 4-valved, were sent for sowing. Other two samples were received, in which *B. 3-locularis* and *B. 4-valvis* were present in about equal quantity without an appreciable number of deviations from either kind. But it was clearly proved that *B. trilocularis* has no more claim to separate specific, or even varietal rank than *B. 4-valvis* has; for there was one plot the seeds of which were sent from the Sonthal Parganas as *Porbi Sarisha*, in which all the plants had pendent pods, but in which many of the plants had the pods towards the tops of the racemes only 2-valved; while in two other plots all the pods were down-turned, exactly as in *B. 3-locularis*, but all the pods on every plant were only 2-valved. The parallel between the erect and the pendent-fruited *Sarsons* as regards the structure of their pods is, therefore, complete.

Finally, perhaps the most interesting sample of *Sarson* received was one of which the seed was sent from Nilphamari in Rangpur. Many of the plants that came up in this plot showed all the transitions possible between erect, spreading, and pendent pods. It is true that in their early stages the pods even of genuine *B. trilocularis* are erect, and only become pendent as they ripen. In the plants referred to,

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however, the pods toward the top of the stem remained erect when ripe, and in this state, moreover, resembled those of *B. 4-valvis* in being decidedly shorter than the lower pods, which were those of typical *B. 3-locularis*.

Not only then are neither *B. 4-valvis* nor *B. 3-locularis* specifically separable from *Sarson* proper, the differences between the two are, at most, not more than racial. Using this last character we therefore find that there are two races of *Sarson*—

- (1) *Natua*, erect-fruited, and
- (2) *Uti*, nodding-fruited,

both races passing insensibly from a 2-valved to a 4-valved form.

No *Sarson* of any kind was sent from CHITTAGONG. Its place there is taken by a quite different plant that does not seem distinguishable from true *Colza*.

1. (a) Erect-fruited, 2-valved *Sarson* is common in SOUTH BIHAR, CHOTA NAGPUR, ORISSA, WEST and EAST BENGAL. But it does not extend north of the Ganges, for not a single sample has been received from TIRHUT or from NORTH BENGAL.

(6) Erect-fruit, 4-valved *Sarson* is, on the other hand, very common in TIRHUT and NORTH BENGAL ; but it extends south of the Ganges, for it is common in SOUTH BIHAR, and is also found in the Mymensingh district of EAST BENGAL. It seems, however, to be quite unknown in CHOTA NAGPUR, ORISSA, or WEST BENGAL, and is not sent from any part of EAST BENGAL except Mymensingh.

2. (a) Nodding-fruited, 2-valved *Sarson* is strictly confined to NORTH BENGAL.

(b) Nodding-fruited, 4-valved *Sarson* occurs also in NORTH BENGAL, and is mainly confined to that region. But it is also reported from SOUTH BIHAR (Arrah) and from the neighbouring district of Palamau in CHOTA NAGPUR, while from the Sonthal Parganas in WEST BENGAL is reported, under the name *Porbi* (Eastern) *Sarisha*, a transition from the 4-valved to the 2-valved¹ state, or *vice versa*, of nodding-fruited *Sarson*.

That the *Sarsons* above described constitute in the botanical sense only different forms of the same plant will be sufficiently apparent from what has been said above, even to those who are not familiar with the *Sarson* crop in all its stages.

The precise treatment to be accorded to them is not, however, at first so clear. Roxburgh treated erect-fruited 2-valved *Sarson* as one species (*Sinapis glauca*) and nodding-

Indian Colza.

fruited 4-valved *Sarson* as another (*S. trilocularis*). But erect-fruited 4-valved and nodding-fruited 2-valved Roxburgh neither describes nor names. Hooker and Thomson, following Roxburgh, make nodding-fruited 4-valved a species (*Brassica 3-locularis*); they further treat erect-fruited 4-valved as a second species (*B. 4-valvis*). Like Roxburgh, they omit nodding-fruited 2-valved altogether, and erect-fruited 2-valved they unite with Roxburgh's *Sinapis dichotoma*, treating both as referable to *Brassica campestris* SUBSP. *Napus*, without separating them from typical *B. Napus* or from each other even as varieties.

Duthie and Fuller separate erect-fruited 2-valved *Sarson* from *B. Napus* and also from *Sinapis dichotoma* as a distinct variety, VAR. *glauca*. They at the same time treat both the erect and the nodding-fruited 4-valved kinds, which Hooker and Thomson looked on as distinct species, as no more than varieties of *B. Napus*. Like Roxburgh, Hooker, and Thomson, they overlook the existence of nodding-fruited 2-valved *Sarson*.

The *Dictionary of Economic Products* reverses the treatment of Hooker and Thomson. The erect-fruited 2-valved *Sarson*, Roxburgh's *Sinapis glauca* (which these authors unite with Roxburgh's flf. *dichotoma* and merge without qualification in *Brassica campestris* SUBSP. *Napus*) is kept apart by Watt as a distinct variety, VAR. *glauca*, of *B. campestris* proper. But the erect 4-valved* and the nodding 4-valved kinds he would place alongside of Roxburgh's *Sinapis dichotoma* and within *B. campestris* SUBSP. *campestris* proper. Watt, however, like the other botanists referred to, does not allude to the existence of nodding 2-valved *Sarson*.

There is not, in the writer's mind, room for doubt that *Sarson*, as a whole, is *not* the European " Rape;" though there is equally no doubt that, with the exception of the Chittagong " mustard " already described, it is the nearest to " Colza " of our Indian *Brassic*as, and is perhaps most suitably treated, from the botanical point of view, as a variety of *Brassica campestris* proper the Colza plant. And obviously it does not affect the position of *Sarson* with reference to *Colza* whether we consider, with Linneus and De Candolle, that Rape (*B. Napus*) is specifically distinct from Colza (*B. campestris*), or if we treat both Rape and Colza as only sub-species of one comprehensive species, that is to include not these alone, but the turnip (*B. Bapa*) as well. But in naming our Indian " Colza " it is impossible to use

* This, by a typographical error, appears in the *Dictionary of Economic FrodueU*, i, 522, as *Brostica quadrilocular* H. f. A T.

Indian Colza.

either of Duthie and Fuller's varietal names, VAR. *glauca*, VAR. *trilocularis* or VAR. *quadrivalvis*. Each of these applies to only one part of *Sarson*, and none of them includes the nodding-fruited 2-valved form of the plant.

It might be possible to use the name *B. campestris*, VAR. *glauca*, on the authority of the *Kew Bulletin* for 1894, where, in a note on Guzerat Rape, the name is formally applied in such a manner as to cover the whole of the Indian "Sarson" crop. It is not, however, quite clear from that note whether the writer of the article means to include our Indian "Rape" also under the name. Indeed, the article does not make it clear that there are two very distinct oil-yielding Indian *Brassicas*, apart from *Bái*, and does not lay stress on the fact that the one erroneously exported under the name "Rape" is not a Rape at all,* but is a plant much more nearly related to Colza. Under the circumstances it seems better to abandon the term "*glauca*" altogether, and to rename the Indian Colza plant *B. campestris* VAR. *Sarson*.

It is generally inadvisable to employ a barbarous name as a scientific term, but the word in this case has the obvious advantage of covering, in popular estimation, precisely the plant intended, whereas each one of the other terms used has varied in its incidence at the hands of different authors, without in a single instance according exactly with the actual facts. The detailed distribution of the four forms of *Sarson* cultivated in Bengal, as shown by samples sent to Sibpur, is given in the subjoined table, along with the names that accompanied each sample. The general distribution is shown on MAP II.

* M. DeCandolle points out (*Prodr.*, ii, 214) that the same want of care in speaking of these plants was very prevalent in Europe during the first quarter of the century. Then, however, it was the fashion to term the Rape plant "Colza," not to term the Colza plant "Sajte."

DETAILS OF SAMPLES OF SARSON.

OS
12

Cultivated at Sibpur Experimental Farm, 1896-97.

1
01.

EBBCT-PBT7ITBD.		NoDDIKG-VBUIBD.	
2-valved.	4-valved.	2-valved.	4-valved.
	Saran <i>Sarson</i> ' Champaran <i>Sarion</i> ' Darbhaiiga <i>Sarson</i> >		
	Shahabad (A rrah) <i>Natua Saraon</i> ' Patna <i>Sanon</i> ' Gaya (Manjrhiawan) <i>Saraon</i> ' „ (Panyft) <i>Tora</i> ' Monghyr <i>Sarron</i> ' Hazanbajfh [KáiJ] <i>Saraon</i> ' Lohardaga <i>Soi son</i> ' Manbhun (No name) • („Singhbhum (mixed with <i>Bai</i> and Bent under that name) '] Angul <i>Ganga Torxa</i> <i>Sanaka</i> ' Palamau <i>Saraon</i> "		Shahabad (Arrah) <i>Vltx Saraon</i> ' Palamau <i>Saraon</i> "

D
C
S
arson

Western Bengal		Northern Bengal		Eastern Bengal		Sonthal Parganas	Sonthal Parganaa
Birnonthal Parganas (Birbhum, Midnapore, Burdwan, Jessore, Murshidabad)		(Godda)		Thartai Saruha'		Dudhxaor Purbi Sat utha' f (a transition from)	
Bankura				Hai or Jhanti Saruha > Sheh or Piyala Sangha'			Ludhta or Pinbi Sanshul 2-valved to Jvalvtd pendent)
Birbhum	bheti Baribha'	Dinajpur	Taro Saruha'				
Midnapore	Sheti Sai'	Rajshahi	Sett Sarxsha >				
Burdwan	Sheh Sai'				Purneab Tara *	Pumeah	Saraao †
Jessore	bheh Saiwha'				Jalpaigun Suet Saruha'		
Murshidabad	Sheh f	Rangpur	Dhepa Saruha'			Ranppur KuiBeong	Sheo Saruha' Sat aoo'
		Mjmensingh (Jamalpur)	Dhupi Saruha'				
		" (Netrakona)	Svett Saruha'				
Dacca	Stoet Santha'						
Backergunge	Makhan Dhana Sartuka'						
Xoakhah	Dhone Sartsha'						
Tippera	Dhone Saruha'						

The Hazanbagh " Ba% " wab a mixture of Sanon and Toti

Indian Colza.

EXPLANATION OF PLATES V, VI, AND VII.

PLATE V.

BRASSICA CAMPESTRIS Linn. *var.* SARSON Prain.(Sinapis glauca *Boxb.*)

Race with erect, 2-valved pods.

1. Plant before flowering, about $\frac{1}{2}$; from an example grown at the ~~Sibpur~~^{Sibpur} Experimental Farm, raised from seed sent from Jessore as Sheti Sarisha.
2. Portion of main-stem with leaf and branch, $\frac{1}{2}$; reduced from Roxburgh's original drawing*
2. Flowering branch, passing into fruit, $\frac{1}{2}$; from Roxburgh's drawing.

PLATE VI.

BRASSICA CAMPESTRIS Linn. *var.* SARSON Prain.(Sinapis trilobularis *Boxb.*)

Race with pendent, 4-valved pods.

1. Portion of stem, $\frac{1}{2}$; reduced from Roxburgh's original drawing,
2. Flowering branch, $\frac{1}{2}$; from Roxburgh's original drawing.
3. Ripe capsule, $\frac{1}{2}$; from Roxburgh's drawing,
4. The same, cut transversely to show valves and dissepiments, $\frac{1}{2}$; from Roxburgh's drawing.



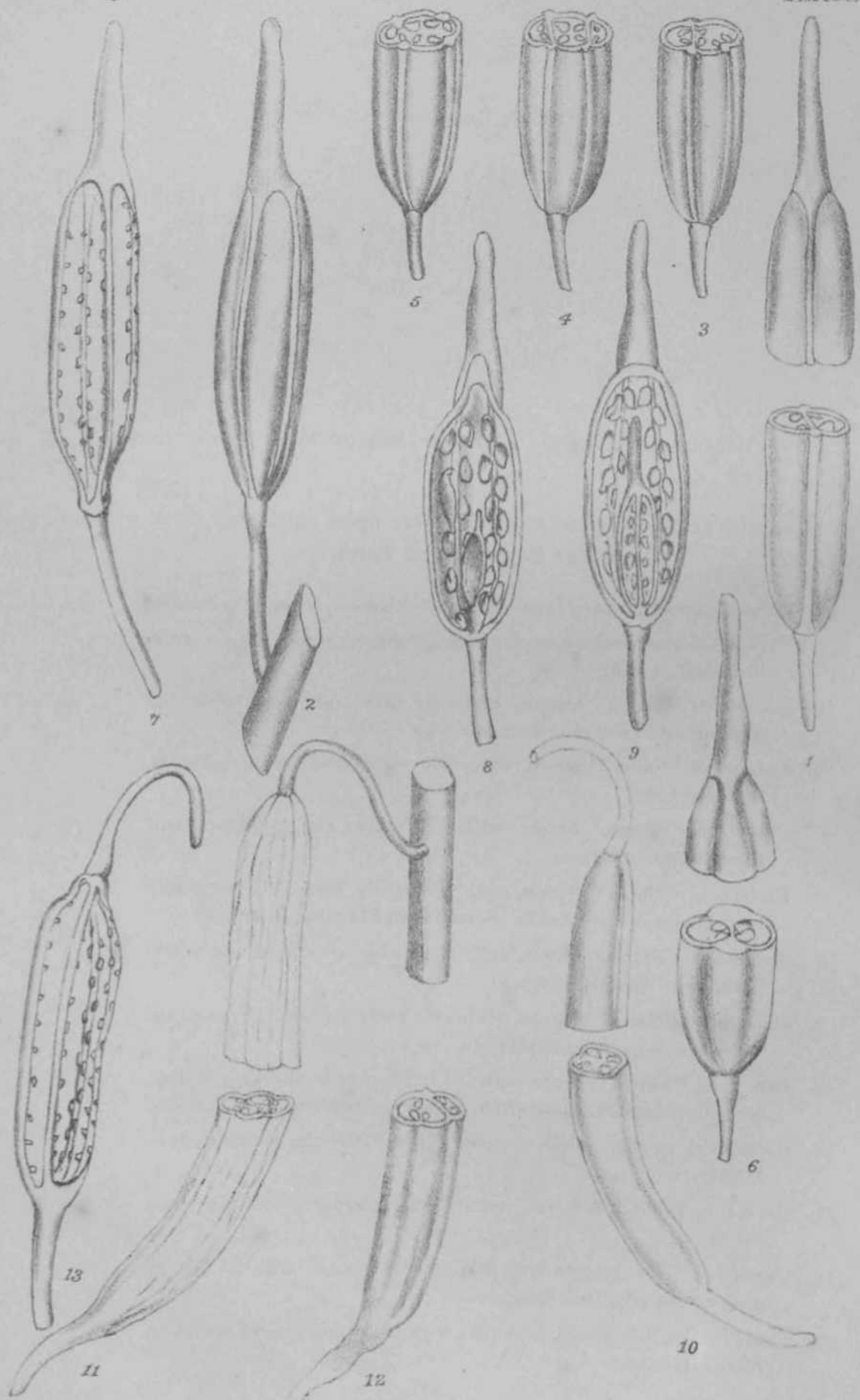
BRASSICA CAMPESTRIS, Linn. var. SARSON Frain.
SINAPIS OLERACEA, Roeb.

Lith. by A.C. Singha.



BRASSICA CAMP[ESTRIS Linn. Var. SARSON Frain.
 SINAPIS TRILOCULARIS Roxb.

Lith by K.P. Dasg.



D.P. del.

Chitra Silpi C^o

ERASSICA CAMPESTRIS Linn- Var. SARSDN Prain.

Indian Colza.

PLATE VII.

BRASICA CAMPESTRIS Linn. var. SARSON Prain.

Capsules of the different races, from examples cultivated at the Sibpur Experimental Farm.

1. Capsule of erect 2-valved; race "Natna," sub-race *glauca*, from Jessore.
2. Capsule of erect 4-valved; race "Natua," sub-race *quadrivalvis*, from Shahabad (Arrah).
3. Capsule of "Natua" Sarson, with only three valves and with the dissepiment to one side, from Burdwan.
4. Capsule of "Natua" Sarson, with four valves and two dissepiments, from Burdwan.
5. Capsule of "Natua," Sarson, with four valves and no dissepiment, from Shahabad (Arrah).
6. Capsule of "Natua" Sarson, with apparently four, but really only two valves, sent as "Jauda" Sarson from Shahabad (Bhujpur).
7. Capsule of "Natua" Sarson, fully ripe, with seeds shed and valves fallen, from Shahabad (Arrah).
8. Capsule of "Nutua" Sarson, with two seeds replaced by small abnormal capsules, from Darbhanga.
9. Capsule of "Natua" Sarson, with the axis ending in a small, complete, centrally-situated capsule within the normal capsule, from Burdwan.
10. Capsule of pendent 2-valved; race "Ulti," sub-race *simplex*, from Jalpaiguri,
- U. Capsule of pendent 4-valved; race "Ulti," sub-race *tnocular*, from Palamau,
12. Capsule of "Ulti" Sarson, with only three valves and with the dissepiment to one side, from Bangpur.
13. Capsule of "Ulti" Sarson, fully ripe, with seeds shed and valves fallen, from Pnrnea.

Details of *Tori*

DETAILS OF SAMPLE 0193
 Cultiva → at Sibpur Experimental Farm, 1896-97.

		TANNER, LATER		1896 97	
TIERES	Champaran	(no name) 1			
	Muzai SL	Tori /			
	Deshing	... Tori /			
—th Bhagalpur					
S. BIRAR.		... Batch /			
					Tori /
I	Lohia	4 /			
	Pala	Is /			
					[Eds.] Loko /
					... Mustard C /
					Choto Saraka /
OsUA	Puri				
	Cuttack	Tube /			
	Angul	abc /			
Balarore					
... 1 1 1 1 1 1					

TV B3XQAL	Sontbal Parganas	.. Zutm ' <hr/>	Sonthal Parganas Hirbhum Burdwan	Maght ' Maght or Lutnt Sartthu ' Sancht ' <hr/>
	Hughh	. Bhunrt ' <hr/>	Midnapore 24-Parganas	Sadharan Saruha ' (' Mustard '')' <hr/>
	Nadia Murshidabad	. Saritha ' .. Sartaka * Jema Saruha * <hr/>	Murshidabad	Bhat* Saruha > <hr/>
N BBVOAK.	Sihguri Jalpaiguri Bangpur (Nilphamarl) " (Kungram) DInajpur Malda	.. Kazha ' .. Sheoa Saruha ' Maght baruha ' .. Kaelta ' . Sarteka ' Saritha ' <hr/>	Purneah Sihgun Jalpaigun	Ton ' .. Turt i .. Maght Saruha ' <hr/>
			Dinajpur	. Turt' <hr/>
			Bajsbahi Pabna	.. Sartaha ' Saruha' <hr/>
E. BIXOAL.			Mymensingh Dacca Fandpur Backergunge	Maght Sartaha I Maght Sartaha ' . Maght & artaha ' .. Maght Sartaha ' <hr/>
CSXTCAOOV0.			[Sadar Banzan Tahsil Cox's Bazar	l" Mustard "] ' .. Sartaha ' "Beddish Bape." <hr/>

Bazaribagh

The Bazaribagh sample named *Rat* was a mixture of *Tort* and *Saraon* and contained no *Jidt*
The Cbittagong "mustard" was a mixture of *Tort* and a plant identified with "European Colza."

Indian Rape.

The detailed distribution of the two forms of *Tori* cultivated in Bengal, as shown by samples sent to Sibpur, is given in the foregoing table, along with the names that accompanied each sample. The general distribution is indicated in MAP I, section J.

The taller later *Tori* is quite unknown in EAST BENGAL or CHITTAGONG. It is very common in the other Divisions. The shorter earlier *Tori* is sent from every Division, and is the most universally grown mustard of the lower Provinces.

In Northern Bengal, Dr. Buchanan-Hamilton informs us, the plant is sometimes deliberately sown very thickly; it then comes up leafy and weak, and the leaves are used as a potherb. The same practice prevails in Sikkim; when grown for its leaves, it is spoken of as a small kind of *Pasdi*, the name for *Brassica mgosa*, when sown for the sake of its seeds only, it is termed *Toori*, the form of the name *Tori* that prevails in North Bengal.

EXPLANATION OF PLATE VIII.

BRASSICA NAPDS Linn. var. DICHOTOMA Prain-

(*Sinapis dichotoma* Eoxb.)

1. Plant before flowering, about 1; from an example cultivated at the Sibpur Experimental Farm, raised from seed received from Bugli.
2. Portion of stem and primary branches with leaves, 1; reduced from Roxburgh's original drawing.
3. Branch with flowers and fruits, 1; from Roxburgh's original drawing.

K.-BHUTIA MOOLA, OR BHUTIA BAI.

BRASSICA NAPUS Linn. 8p. PI 666; var. BSCOLENTA DO. Prodr., L214.

Napus dulcis Blackw. Herö., t. 410.

A cold-weather crop, in the Eastern Himalaya, of short annual, much-branching herbs, 1-5-3'5 feet high, the branches slender, and forming a rather lax head 1-1 tee*



BRASSICA NAPUS Linn. var. DICHOTOMA Pers.
SINAPIS DICHOTOMA Roxb.

Lab. by S. B. Ghose.

Sweet Rape.

across, root swollen, succulent, 2*5 in. long, 2 in. in diam. *Leaves* small, those at the base not exceeding 4 in. long by 2 in. wide, lyrate, all except the basal 2-3 auriculate, decreasing upwards, those in the upper third of the stem 1-2 in. long, '5-'75 in. across, triangular-lanceolate to a bluntish tip, with an entire margin and with large stem-clasping auricles at the base, pale-green, glaucescent, glabrous. *Stems* branching from the axils of the 4th to the 6th leaf upwards, the branches about as strong as, and not much shorter than, the main stem, and again branching. *Flowers* in short corymbs about 1*5 in. long when the lowest flower opens, subsequently elongating into a raceme 8 in. long with equal pedicels -6-*7 in. long, not appreciably lengthening in fruit, slender and without bracts and bractlets. *Sepals* spreading, '2 in. long, '08 in. wide, green, becoming yellowish before falling. *Corolla* #6 in. across, petals with a pale-green, narrow claw ^m12 in. long and a bright yellow regularly obovate blade '25 in. long, *2 in. across, veins faintly greenish beneath. *Pod* 2-valved, including the beak 2-225 in. long, beak narrowly conical, *6 in. long; valves very convex, flexible, thin, leathery, with a strongish midrib and with slender looped veins on each half-valve; valves not beaded opposite the seeds. *Seeds* about 10 under each valve, finely rugose, with a greenish hilum; cotyledons yellow.

SiKkiM.—Grown at from 2,000-5,000 feet elevation, both on account of its leaves and for its esculent root, not for its seeds.

Though sometimes spoken of as a *Moola* and at other times as a *Rdi*, it is neither the one nor the other. The reason for its being termed now a 'radish' and now a 'mustard' is that the people wish to be emphatic in negating the suggestion that it is a turnip. This they certainly are right in insisting upon; their plant is a rape, and the old figure of sweet rape in Mrs. Black well's *Herbal* exactly represents it.

The Bhutias do grow a turnip, and that too of a flavour and quality which no European kind approaches when grown in Sikkim. It is quite unlike the sweet rape in the fact that it never flowers in Sikkim, and the Bhutias have to import fresh seed every year from Tibet. Whether this Bhutia turnip be a true turnip or a Rutabaga, the writer is as yet unable to say, and it will not be possible to obtain complete information till another cold season.

China Cabbage.

EXPLANATION OF PLATE IX.

BRASSICA NAPUS Linn, var. ESCULENTA DC.

1. Root, |; from a specimen cultivated at Rungbee, Darjeeling district.
2. Portion of stem with leaves, |; ditto.
 - . Flowering branch, |; ditto.
4. Fruiting branch, |; ditto,

L.-CHINA CABBAGE; CHINA GOBI OR PAK-CHOI.

BRASSICA CHINENSIS Linn. *Gent.*, 19, N. 52; *Amoen. Acad.*, i*
 281; *DO. Prodr.* i. 215; *Franch. Mem. 8c. Nat Chert.*,
 xxiv. 200.

B. chinensis Linn, VAR.— *Vilmorin, Les'Plantes potagvres*, 3J.^f.

B. campestris Forbes & Hemsl. *Jotirn. Linn. Soc.* xxiii. 46 in
par^ not of Linn.

B. jinncea Forbes & Hemsl. *Journ. Linn. Soc.* xxiii. 47 in P<>^r†
not of E.f. & T.

B. oleracea Linn. 8p. PL 667, VAR. *chinensis* Prain.

Sinapis brassicata Linn. 8yst, ed. xii. iii. App. 231; *ti*^{ox} b,
Uort Beng., 48; *Flor. Ind.* iii. 120.

Pak-choi *Vilmorin, I.e.*; **Pak-tsoi** *Boxb. Flor, Ind.*; **Yea-tsoi**
Roxb. Eort. Beng.

An annual rains garden crop in the Indian plains, of herhs ^th
 very short stocks till the plants begin to flower and with per-
 manent radical leaves forming a loose cabbage -like head resem[^]
 bling that of a leaf-beet, 8-10 in. in diameter; afterwards 'shooting
 into a tall stoutish stem 4-6 feet high, breaking into many srea^d
 ing subequal branches, the whole forming a lax loose head 2-3
 feet wide. *Root* stoutish, tapering, 6 in. long. *Leaves* very large,
 the blades of the basal 8-12 in. long, 5-8 in. wide, obovate or ova-
 obtuse, the margin entire, more or less undulate, tapering abrup^t
 ly at the base, where they are slightly lobed or lyrate, to a thic^k
 white fleshy stalk 8-12 in. long, 1-1*5 in. wide, continued into
 the leaf-blade as a broad white fleshy main-nerve, neither ridge^d
 nor bristly, giving off fanwise several smaller white basal veins,
 the main rib also branching laterally beyond, the blade glaucous.
Stem branching, as soon as it shoots, from the axils of all leaves abq.^{ve}
 those of the stock, the stem-leaves like the basal, but smaller, sessne,
 decreasing upwards, those beyond the upper third of the stem ana
 the branches being eared and stem-clasping at the base. *lower⁶



BRASSICA NAPUS Linn. VAR. ESCULENTA D C.

Lith. by New Chitra. Silps. 68.

China Cabbage.

in dense wide corymbs 1 in. long and 2 in. across when the flowers open, subsequently elongating into racemes 6-8 in. long, with equal pedicels 7-8 in. long, slender and without bracts or bractlets, elongating slightly in fruit. *Sepals* slightly spreading, 2 in. long, 8 in. wide, still glaucous and greenish when they fall. *Corolla* 6 in. across; petals with a yellow claw 15 in. long and a spreading bright yellow orbicular blade 25 in. across, veins darker orange above. *Stamens*, the short pair with recurved anther tips, the two longer pairs with anther tips incurved.

- *Pods* 2-valved, including beak 2-2.5 in. long, .25 in. thick; beak rather thickly conical, .5 in. long; valves convex, rigidly leathery, rather finely nerved, distinctly beaded opposite the seeds. *Seeds* 10-15 under each valve, spherical, dark-brown, somewhat rugose; hilum pale red-brown; cotyledons pale yellow.

This is certainly of Chinese origin. It does not appear to have ever been introduced by an overland route, and the first mention of its importation to India is that by Roxburgh in 1814. It never seems to have been a favourite vegetable, in spite of the fact that it is available in the rainy season when other vegetables are scarce, though in certain circles it is viewed with such favour that an order has recently been issued enjoining its cultivation in jail gardens. Prisoners are said to like it; it is, however, doubtful what value can be placed on a prisoner's opinion; any one save a prisoner, questioned regarding the merits of China cabbage, is likely to say he did not know of their existence.

Vilmorin terms this a "Cabbage," and the writer fully believes that we see in this plant yet another derivate of the stock from which Cabbage, Borecole, Broccoli, and Kohl-Rabi alike have sprung, as different in character from any of these as they are from each other. Forbes and Hemsley, however, think rather that it may be a derivate of the stock whence the Colza, Rape, and Turnip have sprung.

There is very little doubt that Roxburgh was right in identifying this plant with the *Sinapis brassicata* of Linnaeus and of Willdenow. If this be so, then *Sinapis brassicata* Linn, and the plant that by common consent we identify with *Brassica chinensis* are one and the same thing. Forbes and Hemsley disagree with Roxburgh, and identify δ , *brassicata* Linn, with *B. juncea* H. f. and T. This is not a possible identification, since Linnaeus says δ . *brassicata* has the uppermost leaves stem-clasping, while the one character that makes the identification of *S. juncea* certain is that all its leaves taper to a narrow wedge-shaped base. That

Systematic Synopsis of the

& *brassicata* Roxb. is the same as the *Brassica chinensis* of gardens admits of no dispute : not only is Roxburgh's description fall and accurate; he has left behind an excellent coloured drawing, which shows that his plant not only bears the same Chinese name, but is actually the same as the plant figured 80 years later by Vilmorin.

EXPLANATION OF PLATE X.

BRASSICA CHINENSIS Linn.

1. Plant before flowering, about 1/2; from Vilmorin.
2. Radical leaf, £; reduced from Roxburgh's original drawing*
3. Portion of flowering-stem, branch and leaves, £; reduced from Roxburgh's original drawing.
4. Stem-leaf, detached, |; reduced from Roxburgh's original drawing.
6. Portion of flowering-stem, £; reduced from Roxburgh's original drawing.
6. Flower, |; from Roxburgh's drawing.
7. Capsule, |; from Roxburgh's drawing.
- 8* The same, cut transversely, |; from Roxburgh's drawing.

SECTION III.—SYSTEMATIC SYNOPSIS OF THE CABBAGES, COLZAS, RAPES AND RARS,

SHOWING THE RELATIVE POSITION OF THE BEN GAL FORMS.

I.—BRASSICA OLERACEA Linn. Leaves glaucous or green, without hairs ; only the flower-leaves clasping the stem at their bases; the others very variable in shape, size, arrangement and coloration. The CABBAGE-group :—

VAR. I. *sylvestris*. Stem slender, branching; leaves glaucous; radical leaves vanishing, stem-leaves not collected in a head. COLEWORT or " WILD CABBAGE " of Western Europe. More probably a plant that has become feral by reversion than the original stock whence cabbage has been evolved.

VAR. 2. *acephala*. Stem stout, not swollen, simple or very rarely branched ; leaves green ; radical leaves vanishing, stem-leaves not collected in a head. KALE, BORECOLE, COW-CABBAGE are among the familiar forms included under this variety.



BRASSICA CHINENSIS, Linn.

Lith. by A. C. Mukerjee.

Cabbages, Colzas, Rapes and Rais.

VAR. 3. *bullata*. Stem stout, not swollen, simple 'or very rarely branched; leaves glaucous, always bullate; radical leaves vanishing :—

Race a. SAVOY. Leaves in lax heads at top of stoutish stem, without leaf-buds.

Race p. SPROUTS. Leaves in a spreading loose tuft at top of elongated stem, with numerous small compact heads in the axils of the present and of the fallen leaves.

VAR. 4. *Botrytis*. Stem short, stout, not swollen, simple below stem-leaves; leaves glaucous, radical leaves vanishing; stem-leaves few, closely applied outside a rounded compact mass of white, fleshy branches. CAULIFLOWER and BROCCOLI.

VAR. 5. *capitata*. Stem short, stout, not swollen, simple; leaves glaucous; radical leaves vanishing; stem leaves many compacted in a dense head. CABBAGE proper, whether globose, flat or conical, and whether red or -white.

VAR. 6. *caulo-rapa*. Stem short, stout, simple, swollen turnip-fashion beneath the origin of the loosely tufted glaucous stem-leaves; root-leaves vanishing. SUM CABBAGE, or KOHL-RABI.

VAR. 7. *chinensis* (sp. *Linn.*). Stem none till time of flowering; leaves glaucous, radical leaves persisting to form a loose head like that of 'Leaf-Beet.' CHINA CABBAGE.

II. *BRAO3ICA CAMPESTRIS* Linn. *ampl.* Leaves glaucous or green, usually at least the lowest leaves hairy; both stem- and flower-leaves clasping the stem at their bases. The RAPE and COLZA

SUBSP. A. *CAMPESTRIS* (sp. *Linn.*). Leaves very glaucous, at least the lowest leaves with hairs beneath; radical leaves not clasping. COLZA group : -

K. 1. *agrestis*. Root fusiform, stem elongated, leaves mostly rather markedly hairy. WILD NAVEW of Western Europe. More probably a plant become feral by reversion than a wild native stock.

VAR. 2* *oleifera*. Root fusiform, stem elongated, only the lowest leaves markedly hairy, pods narrow, valves thin; plants naturally biennial. COLZA.

Systematic Synopsis of the

VAR. 3. *Sarson*. Root slender, tapering, stem elongated, only the lowest leaves markedly hairy, pods wide, valves thick; plants always annual. SARSON; the Indian COLZA.

Bace a. NATUA. Pods erect—

Subrace 1. *glauca* (sp. *Boxb.*; *Wittm.*) pods 2-valved.

Subrace 2. *quadrivalvis* (sp. *H. l. §f T.*) pods 4-valved.

Bace p. ULTI. Pods pendent—

Subrace 1. *simplex*. Pods 2-valved. This form has been overlooked by authors who have dealt with Indian Colza.

Subrace 2. *trilocularis* (sp. *Boxb.*; *H. l. §" *.*) Pods 3-4-valved.

VAR. 4. *pabularia*. Root fusiform, stem abbreviated, root-leaves subpersisting, edible.

VAR. 5. *napo-brassicata*. Root swollen, esculent :—

Bace a. Root white. The SWEDISH TURNIP.

Bace p. Root yellowish. The RUTABAGA.

Subsp. B. NAPUS (sp. *Linn.*). Leaves only glaucescent, all or almost all glabrous, and all except the very lowest auricled at the base. The RAPE group:—

VAR. 1. *oleifera*. Root very slender.

Bace a. Pods spreading. WINTER RAPE.

Bace p. Pods ascending (sp. z= *B. pncecox Waldst. §f Kit.*; *Sinapis dichotoma Boxb.*). SUMMER RAPE of Europe; the LUTNI, MAGHI, or TORI of Bengal.

VAR. 2. *esculenta** Root swollen. SWEET NAVET of Europe; BHUTIA MOOLA, or BHUTIA RIGI of the Eastern Himalaya.

SUBSP. C. RAPA (sp. *Linn.*). Leaves green, the lower hairy or bristly, the* upper smooth. The TURNIP group :—

VAR. 1. *oleifera*. Root slender.

VAR. 2. *esculenta*. Root swollen. TRUE TURNIPS.

Subrace 1. *oblonga*. Roots oblong, gradually tapering downwards.

Subrace 2. *depressa*. Roots globose, suddenly contracted into a slender tip.

Cabbages, Colzas, Bapes and Rais.

III.—BRASSICA JUNCBA H. f. & T. Leaves green or little glaucous, usually the lowest hairy, none of them ever stem-ciasping. The RA'I group.

SUBSP. A. JUNCEA (sp. *Linn.*). Leaves all lyratly-lobed except in the region of the inflorescence ; radical leaves vanishing.

VAR 1. *agrestis* (sp. = *Sinapis chinensis Linn.*; *S. patens Boxb.*). Stem-leaves little-lobed; plants small, wild. This appears rather to be a form of *Bdi* become feral by reversion, than the stock whence *Bdi* has oiiinated.

VAR. 2 *oleifera* (sp. = *Siuapis ramosa Boxb.*). Stem-leaves much-lobed ; plants tall, cultivated. The true RA'I. *Subrace 1. elata.* Tall, late, rough below, smooth, above.

Subrace 2. aspera. Medium, early, rough with bristly hairs.

Subrace 3. laevis. Medium, early, smooth, dark-stemmed.

SUBSP. B. RUGOSA. None of the leaves distinctly lyratly-lobed, radical leaves peisisting.

VAR. 1. *agrestis* (sp. = *B. dentata Watt Mss.*). Leaf-margins very sharply dentate, midrib rather narrow, stem elongated. Perhaps this is a feral form of the next variety rather than a wild stock.

VAR. 2. *typica.* (sp. = *Sinapis rugosa Boxb.*). Leaf-margins very sharply dentate, midrib very broad, stem none till time of flowerjng', green stems not glaucous, leaves green. PASAI.

VAR. 3. *cuneifolia* (sp. *Boxb.*). Leaf-margins slightly serrate, midrib broad, stem none till time of flowering; purplish stems distinctly, leaves slightly glaucous. LAHI SAO.

SECTION IV — GEOGRAPHICAL REVIEW OF THE LOWER PROVINCES MUSTARDS AS INDICATED BY SAMPLES CULTIVATED AT THE SIBPUR EXPERIMENTAL FARM, 1896-97.

to

PBOVIWCB.	Division.	District	Subdivision	Mustard	Names sent	REMARKS
1	2	3	4	5	6	7
Bihar	Patna	Patna	Dmajpux	SABSOV	<i>JRdt Sarson</i>	Tall, late subrice, sample clean Erect, 4-valved pods, seeds white, sample clean
»	M	if	if			
»	M	Gaya	Ragai	R II	<i>Jdt, "Rape"</i>	Smooth, early subrace j sample clean
»	fr	"	Manjtiawan	SABSOJT	<i>Sarson, "Mustard"</i>	Erect, 4-valved pods, seeds white, sample clean, reaped, 7th February, 1897.
		"	Panya Khnrd	u	<i>Toro, "Mustard "</i>	Erect, 4-valved pods, seeds white, sample clean This only differed from the preceding in ripening a week earlier, reaped, 1st February, 1807.
»		»				
ft	fr	Shahabad	Azmatganj	TOBI	<i>Tort "Rape"</i>	Short, early subrace, sample clean.
fr	fr	if	Arrah	EAI	<i>Darah Ra</i>	Smooth, early, sample clean
fr	fr		if	l>	<i>Lutnx Bat</i>	Smooth, early, sample clean, ripening several days before preceding.
fr	fr		if	SASBOV	<i>Jaudanarto, "Rape"</i>	Erect, 2-valved but with broad pods like those of 4-valved, seeds white, a little of pendent, 4-valved mixed.
»	>	ii	M	II	<i>Natua sarso, " Rape "</i>	Erect, 4-valved, seeds white, sample clean.
M	Jr	>	fr	fr	<i>VIUuartOy "Rape"</i>	Pendent, 4-valved, seeds white; sample clean
fr	M	if	Bhnjpor	Rli	<i>J?dt, " Mustard"</i>	Tall, lite subrace, sample clean
fr	fr	M	fr	II	<i>Langn, " Rape "</i>	Tall, late and smooth, early subraces mixed
fr	fr	if	II	M	<i>Lalkx tort, "small reddish-brown Rape "</i>	Tall late .Eat, sample clean.
>	fr	if	II	SulBSOW	<i>Punka toro, "bold yellow Rape"</i>	A slightly branched, very late form, poda erect, 2-valved, seeds very large, yellow , sample clean

Geographical Review

"	"	"	"	"	"	<i>Puxrkt tort, "yellow rape "</i>	<i>Erect, 2 valved, seeds white, sample dean This IB the common Sarson of Bengal Proper</i>
"	"	"	"	"	"	<i>Lallca tota "hold reddish* brown Rape'</i>	<i>Erect, 2-valved, seeds brown, sample clean. Plints rather dwarf for Sarson, early ripening This is the only un- mixed brown-seeded Sarson received</i>
"	"	Muzaffarpur	Sitamarhi	RAI	"	<i>Eat</i>	<i>Tall, lite suhrice, sample clean.</i>
"	"	"	"	SABSCHT	"	<i>Sarso</i>	<i>Erect, 4-valved for the most part, wine pendent, 4-valved scattered thioughout the plot, but no mteimmediate forms; the pendent all white seeded, a consider- able* proportion of the erect brown- seeded.</i>
"	"	"	"	TOBI	"	<i>Tort, "Bape"</i>	<i>Taller, later unbrace, sample clean.</i>
"	"	Darbhanga	Madhabam	RAI	"	<i>Tort</i>	<i>Rough, early subrace, sample clean</i>
"	"	"	"	SABSOW	"	<i>Sarso</i>	<i>Erect, 4-valved, seeds 85% white, 15% brown</i>
"	"	M	"	"	"	<i>Jtaicht</i>	<i>1 allei, later subrace, sample clean.</i>
"	"	Saran	Chapra	TOBI	"	<i>Jlai or takt</i>	<i>Tall, late subince, sample dean.</i>
"	"	it	"	RAI	"	<i>Sarson, " Rape"</i>	<i>Erect, 4-valved, but with the uppermost pods in most plants only 2-valved, seeds 90% white, 10% brown, interesting as a connecting form</i>
"	"	"	"	SABSO*	"	"	<i>Erect, 4-valved, seeds 85% white, 16% brown.</i>
"	"	Champaran	Motihari	"	"	<i>Sarson</i>	<i>Smooth, early subrace, sample clean</i>
"	Bhapaipnr	Bhagalpur	Supal	RAI	"	<i>Eaicht Bat</i>	<i>Erect, 4 valved for the most pait, some pendent, 4-valved scattered thioughtout the plot, but no intermediate iorms, the pendent ill white-scedtd, a consider- able proportion of the erect brown- seeded</i>
"	"	"	"	SABSOJT	"	<i>Sarso</i>	<i>Shorter, earlier kind, sample clean.</i>
"	"	"	"	"	"	<i>Tort</i>	<i>Tall late subiac, sample dean</i>
"	"	Monghyr	Monghyr	TOBI	"	<i>Qota or tort</i>	<i>Erect, 2-valved, 75%, mixed with about 25% erect 4 valved, seeds 90% white, 5% brown</i>
"	"	"	M	RAI	"	<i>Sarson, "Rape"</i>	<i>Taller, later kind, simple dean</i>
"	"	"	"	SABBOIT	"	"	<i>Roujrh, early subrace, sample dean.</i>
"	"	"	"	"	"	<i>Hacht</i>	<i>Pendent, 4-valvcd, heeds very large, all white, sample dean</i>
"	"	Purnea	Ararta	TOBI	"	<i>Sarsoo</i>	<i>Shorter, earlier kind, sample dean</i>
"	"	"	"	RAI	"	"	"
"	"	"	"	SABBON	"	"	"
"	"	"	"	"	"	<i>Tort</i>	"

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PaovircB	Division	District	Subdivision	Mustard.	Names sent.	REMARKS
1	2	3	4	5	6	7
Bihar	Bhagalpur	Purnea	Sadar	RAX	<i>Eatcht</i> , "Mustard"	Tall, late Mibnce, sample clean Th name <i>*ont, btmfr</i> in form diminutitt was not appropnate to the plant
"	"	"	Eishanganj	SABSOV	<i>Tara</i> , "Mustard"	Pendent 2 \ahed, with placentas normal and replum complete, one of the most impoi ant <i>*"m</i> , les as being a connecting link between <i>8 glauca</i> Roxb and <i>S 3 loculai</i> w Roxb , seedb white, sample clean
"	"	Maldah	Snchanpur	Rli	<i>Edt</i>	Tall, late subrace, simple clean
"	"	"	"	TODI	<i>Sarxaha</i>	Taller, later kind, sample clean
"	"	Sonthal	'Par Godda	BAX	<i>Gota</i>	Rough, earl} subrace, bample clean.
"	"	"	"	"	<i>Eai</i>	Tall, late subrace, sample clean
"	"	"	"	SABBOW	<i>Santha</i>	Erect, ivahed, seed white, sample clem
"	"	"	Jamtara	Rlr	<i>lidn garthha</i>	Smooth, early subrace, sample clean
"	"	"	Etajmahil	SABSON	<i>Purbt Sai isha</i>	Pendent, partly 4-valved and pirtlv 2 ralved with mauy intermediate iorms, HCC Willie
"	"	"	DumLa	"	<i>TAana</i> , "Mustard"	Erect; 2-valved white-seeded, 90%, mixed with 10% rough, early <i>Sat</i>
"	"	"	"	TOBI	<i>Lutt</i> , "Mustard"	Taller, later kind, simple clean
"	"	"	Jirnabari	"	<i>Maghvsansha</i> , "Mustard"	Shorter, earlier kind of <i>Ton</i> , 60%, mixed with about 40% of tall, late <i>Bdi</i> .
Chota Nagpur	Chota Xagpur	Hazaribagh	Hazanbagh	SAHSON	<i>Sarsm</i>	Erect, 2-valved, seed white, sample clean.
"	"	"	"	OBX	<i>Lutm</i>	Shorter, earlier kind, mixed with it some plants of <i>Sat son</i> (erect, 2 wived) and a few plants of <i>Bdi</i> (rough, eaily subrace)
"	"	"	"	"	<i>Eat</i>	Shorter, earlier kind clean sample (not a single plant ot <i>Kdi</i> m the plot)
"	1 it	Ijohardaga	Lohardaga	SABBOIT	<i>Sarso</i> , "Mustard"	Erect, 2-valhed, seeds 90% white, 5% Drown
"	"	"	"	Tom	<i>Lutm</i> , "Rape"	Taller, later kind, sample clean.

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"	"	"	Palamau	SARSON	I Sat son, "Rape"	Pendent 1 valved seeds white 75 ¹ / ₁ mixed withie t 2 aired white seeded Sarson
"	"	"	"	TORI	Lutnt, "Muetaid "	1 aUer, liter 1 ind, sample clean
"	"	Smghbhum	Chituboa	BAI, S ^B SUTT	Xdi	Erect 2 vahed, white seed d Sat son and
"	"	"	"	Tom	Lutnx	ough eailj Tdi in equal parts
"	"	"	"	"	Chota tanthd	Taller, liter kind sample clean
"	"	Hanbhurn	Maubhum	SXBBOSt	'JJape"	Shorter, eaihor kind, sample clean
Onssa	Onssa	Bahsore	Jialawre	TOBI	"Mustard ^M	Erect 2 valved, seed white, sample clean.
"	"	Cuttack	Kendrapora	"	JiZasartTid	Shorter, earlier kind, sample clean
"	"	"	Angul	RI.	Ckoto taruhd, "Mustard "	Ditto ditto
"	"	"	"	SABBOK, TOBI	Oanga Torui sartsha,	Taller htei 1 ind, sample clean
"	"	"	"	"	"Mustard	Tall, late subra e, sample clein
"	"	"	"	"	"Mustard	Erect 2 viUcd, -white seeded Barton,
"	"	"	"	"	"Mustard	and taller later kind oi Tori in equal amounts
Bengal	Burdwon	Part	Pun	TORI	Bur sariahd, "Mustard"	Toilet, later 1 ind, sample clein
"	"	Bankura	ishnupur	Bli	8d)iahd	Ditto ditto
"	"	"	"	SABSOT	Lutnt	Rough, eaily <subiace, sample clean
"	"	"	"	"	Beth or Ptyala sariahd	Erect 2 valved and erect 4 valved in equal amouut, seed 90% white, 10% brown
"	"	"	"	"	Edi or Jhemti aanahd	Erect 2 valved and erect 4 valved in equal amount, seed 90% white, 10% brown
"	"	Hughh	Serampore	RAI	Kala <ai |*hd	Tall, late subrace, sample clean
"	"	"	Jalunabad	"	JhUM	Ditto ditto
"	"	"	"	TORI	Bh t in	Taller later kind, sample clean
"	"	Birbhum	Suri	SABBOH"	Shett taruhd	Erect 2 valved, seed 9U% white, 10% brown
"	"	"	"	"	"	Short r earlier kind, Bample clean
"	"	"	"	"	"	Hough, early subrace, simple clean
"	"	Burdwan	KhandghoB\	TOBI	Ltd it or lddgh%	Ditto ditto
"	"	"	Mangalkot	HAI	Bai	Erect 2 vahed and eiect 4 valved in equal parts, seed all white, veij uniform
"	"	"	"	"	Mai or Mdghh	Shorter, earlier kind, sample clean
"	"	"	"	SABSOV	Dhepo aett,	Ditto ditto
"	"	"	"	"	"	Erect 2 vahed and eiect 4 valved in equal parts, seed all white, veij uniform
"	"	"	"	"	"	Shorter, earlier kind, sample clean
"	"	"	"	"	"	Ditto ditto
"	"	Midnapore	Coxa	TOBI	Sancki	Bough earlier and smooth early subraces in almost equal pioporti ns
"	"	"	Midnapore	RAI	* Mubtird "	Smooth, early subrace, oariple clean
"	"	"	"	"	Edi tat iskd	Shortei, eaihor kind, sample clean
"	"	"	"	"	"	"
"	"	"	"	"	Wat hi satinhd	"
"	"	"	"	TOBI	Sadhuran sarwhd	"

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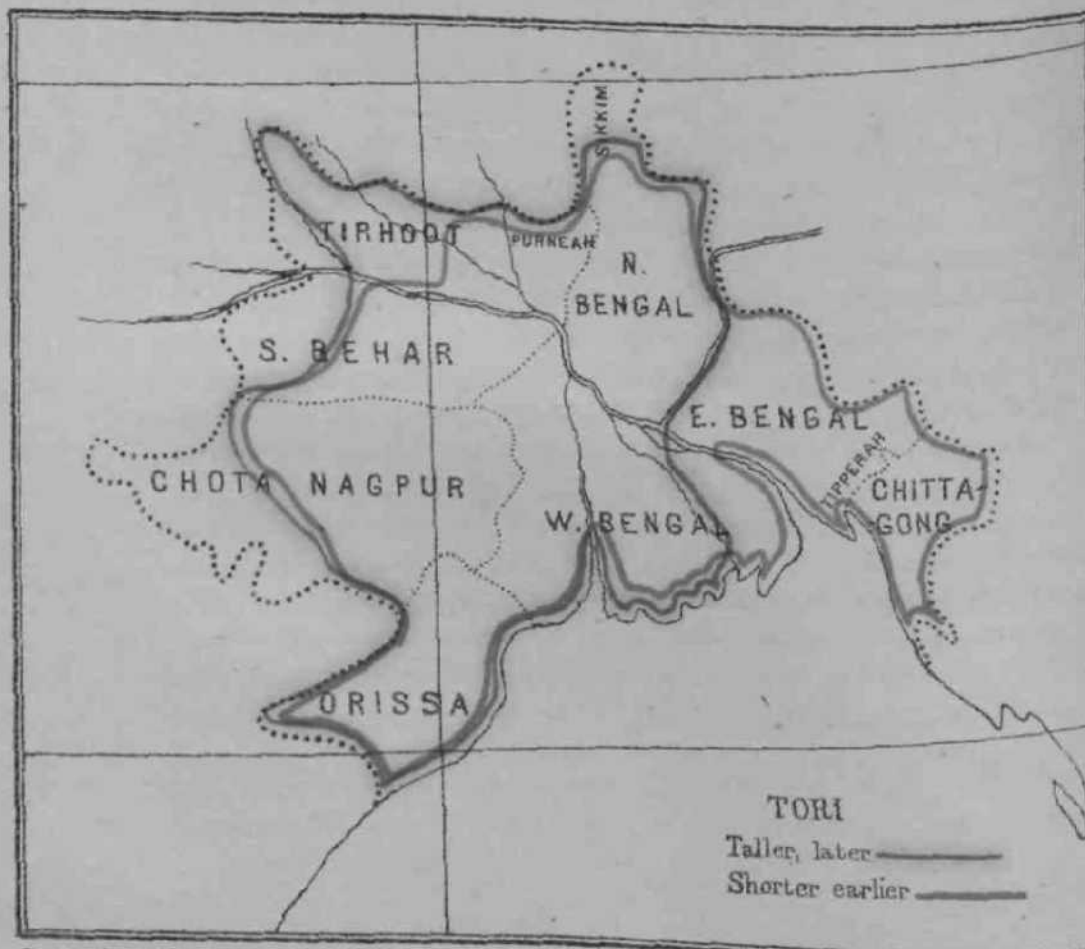
PBOTXNCB	Division.	District.	Subdivision	Mustard	Names sent	BEVABXB.
1	2	3	4	5	6	7
Bengal	Burdwan	Midnapore	Garhbeta	SABBOZT	<i>Sketi Sdi</i>	Erect, 2valved, seeds white, sample olein
»		w	it	SABSOIT, TOEI	<i>Sadha bheta Sd%</i>	Erect, 2 valved and erect 4 valved <i>Sarton</i> , each 30%, taller late <i>Ton</i> 40%
»	Presidency	21 Parganas	Alipar	Ril	<i>Kazh taruhd</i>	Rough, early «nibrace, sample clean
ft	M	ti	Dimuldia	TOBX	Mustard	Shorter earlier kind, sample clean
»	N	Nadia	Sadai	KAI	<i>Sdi, Rape</i>	Smooth early subrace, ditto
»	II	»	Narad	TOBX	<i>Samhd, Mustard</i>	Taller, later kind, ditto
ff	II	Jessore		KAI	<i>Maght taruhd, Mustard</i>	Tall, late subrace, ditto.
it	II	fi	ii	»»	<i>J?rf, Rape</i>	Ditto ditto
M	fi	ff	it	BASSOS'	<i>Sheh taruhd, White Mustard</i>	Erect, 2 valved, seeds all white
»	II	Murshidabad	Jangipur	RAI	<i>Sdi</i>	Tall, lite subrace, sample clean.
»	If	if	»	JOBI	<i>Santhd</i>	I all, late subrace, sample clean
tt	II	if	Kandi	RAI	<i>Rape</i>	Rou^h, early «ubracc, sample clean
tt	II	ii	Sadar	TOBI	<i>Jema Sartshd, Mustard</i>	Taller, later kind, sample clean
w	if	ii		SABS ON, BXI	<i>SeU, rape</i>	Erect, 2 valved, white seeded <i>Sarton</i> 60%, tall, later <i>Sdi</i> 40%
tt	»	Bajshahi	Naogaon	TOBI	<i>Bhat% Santhd, Rape</i>	Shoiter, earlier kind, sample clean.
it	»	»	II	BAI	<i>Sdi</i>	Tall late subrace, sample clean Stems verj daik purple
»	»	»	»	SABSOZT	<i>Seti Santhd</i>	Erect, 2 valved and erect 4 valved in about equal proportions, seeds all white
if*	II	»»	Alakhi	TOBI	<i>Santhd</i>	Shorter, earlier kind, sample clean
M	it	Dinajpur	Mornai	SABSOW	<i>Taro Saruhd</i>	Erect 4valved, seeds white. Poor sample, which germinated badly
»»	ii	if	INTituaganj	TOBI	<i>Santhd</i>	Taller, later kind, sample clean
tf	it	»	Badtrganj	u'ii	<i>Toon</i>	Shorter, earlier kind, sample clean,
t	»	Rangpur	Gaibanda	SABBOIT	<i>Sdi Sai tshd</i>	fall, late subrace, sample clean
.	»	it	Nilphaman	»	<i>Dhepa Santhd</i>	Erect 4 valved, seeds 80% white, 20% brown
					<i>Sett Saruhd</i>	Eicct 4 valved and pendent 4 valved in about equal proportions, with many mtei mediates between these two subrace, seeds all white.

Oographic Re 2

"	"	"	Kungrnm	TOBT	Mdffh% Samhd	Taller, liter kind sample clean
"	"	"	"	SARSOJT	SheoaSai%ahd	Pendent 4 valved, seeds all white
"	"	JaJpaig-un	PhaJkota	TOBI	Kazlia, • bustard "	Taller liter kind, sample clean
"	"	"	Devigaaj	"	Bdt	Tall, lite «ubrace; sample clean
"	"	"	"	SXMBOTT	Hdi Sarthhd	(ROUT) earli subrnce, *ample clean.
"	"	"	"	"	Sicet Sartshd	Pendent, 2 valved, seeds 05% white, 6% brown
"	"	"	Jalpaigun	TOBI	Shena Sanshd	Tiller, later kind, sample clean
"	"	Darjeeling	Siijj-un	"	Might Surnhd	Shorter earlier kind, sample clean
"	"	"	"	"	Kazha, or "purple"	Taller, latei kind, sample clein
"	"	"	Kurseong	SABBOW, TOBI	Ton, or "black" Sanshd	Shorter, earlier kind, sample clean
"	"	"	"	"	Sarsoo	Pendent 4vahed, white seeded Sarson and taller, later Tort in equal amount
"	"	"	Kahmpong	GIBKHALI Uli	Sdi	Both npcned well.
"	"	Pabna	Garajanj	RAI, TOBI	"	fitnapis rugosa Roxb ! Did not npen properly
"	"	"	"	"	"	Tall, late Bdt and short early Tort mixed in equal proportions
"	"	Dacca	"	TOBI	Sanshd, "Mustard"	Shoiter, earlier kind, clean sample
"	"	Mymensingh	Sadar	RAI	Xdi	Tall, late subracc, sample clean.
"	"	"	Netrakona	SABBOR-	Moghat	Tall, late subrace, sample clean
"	"	"	"	"	BtoeU Sartshd	Erect 4 valved 75% mixed with erect
"	"	"	Jamalpur	Itti	L%	2 valved 2i%, beeds all white.
"	"	"	"	SARSON	Dhupt Santhd	Tall late subrace, sample clean.
"	"	"	"	"	"	Erect 4vahed, 50% tall white seeded plants and 60% considerably shorter brown seeded plants, exactly like the
"	"	Dacca	Munshiganj	TOBI	Jlfdght Samhd	Lalka Tm a of Shahabid
"	"	"	"	KAI	Eat Saiuha	Shorter, earlier kind, clein sample
"	"	"	"	SABSOV	bicet&arthd, "Rape"	1 all late subrace, simple clean
"	"	"	"	"	"	Erect, 2vahed, seeds white, sample clean.
"	"	Faridpnr	Sultan pur	TOBI	MdqhtSaruhd, "Rape"	Shorter earlier kind, sample clean.
"	"	"	Sobharanpar	RAI	Sdi Sartshd	Tall, late subiace, sample clean.
"	"	Backerguuge	Gurnadi	TOBI	Mdght Sandid	Shorter earlier kind, (ample clean
"	"	"	Habiginj	RAI	Kila Shatishd	Tall, late subrace, sample clean
"	"	"	Bansal	"	Jfirri Sanshd	Ditto ditto
"	"	"	"	6ABSOV	Makhhan Dhand Saruha	Erect, 2vahed, seeds white, sample clean
"	"	Tippera	Kotwah	TOBI	Mdqhi Vanshd	Shoiter, earlier kind, sample clean
"	"	"	"	RAI	Edi Saruhd	Kough, early subrace, sample clean
"	"	"	"	"	MoghU Sartshd	Ditto ditto

PBOVUTCB.	Division.	District.	Subdivision.	Mustard.	Names sent.	BBUABKB.
1	2	3	4	5	6	7
Bengal ...	Dacca ...	Tippera ...	Kotwali ...	SAB6OK ..	<i>Dhone Sarithd</i>	Erect, 2-valved; seeds white; sample clean.
Chittagong ...	Chittagong ...	Noakhali ...	Sadarām ...	SABSON; REI ..	<i>Dhone Sarithd</i>	Erect, 2-valved, white-seeded <i>Sarson</i> 90%;&rfno%
	w ...	Chittagong ...	Ranzan Tahsil ...	IUi ...	"SmaUJffri"	A mixture in almost equal parts of the "roush early" and the "smooth early" subraces of <i>JRdi</i> or of plants not botanically distinguishable from these. But the seeds were brighter red in both than in any other sample of <i>Rdi</i> , and both ripened as late as the tall late subrace from elsewhere.
	if ...	> ...	Cox's Bazar ...	TOBI ..	<i>ftariihd</i>	Shorter, earlier kind; sample clean.
	ii ...	fi ...	Sadar ...	"BAPB"; Toai ...	"Reddish Rape "	Ditto. ditto.
	>l ...	ti ...			"Mustard"	A mixture in equal parts of shorter earlier <i>Tori</i> and of a plant, scut from no other district, branchim? freely from the base, with fblatre like that of <i>8ar*on</i> , but with pale red seeds smaller than <i>Tori</i> seeds, and hardly larger than those of <i>E di</i> .

Be OR Mustard.



Hamea of the Must
SECTION ^ HBB*22* £ SgSSr IN BENGAL TO
8AB80N AND « W J J f ^ is GROWN
DISTRICTS IN WHICH EA ... a grown in ^ the e it

1.
divisi

seed sent were in equal parts from g ^ f c a g b, P*oved *o be Tori
second sample sent as »* from
mixed with Sarsm.

Ammon in the eastern distn ^cts of
The two earlier * * « * " £ ? are cultivated thro a t
Tirhut and extending into f^{1pW} | Scts of West Bengal, cross g
So.th Bihar and in the d n ^ ^ ^ W j : j again
the Hooghly into Nadia and t t »* e l o a i t e unknown t n b . in ^ an
in Tippera and Chittagong, but W ^ l o s e d f r e n e)
vening area (MAPI, S_{KC} « OKA., » ^ t frotn Chittagong and
The taller later subrace, J J * ^ N a p u r , is J ^
Tippera, and altogether wantm g m ^ t a N a p u r , reported rom

dar T ^ ^ J ^ V * * ? * * *
Northeni and Central Tirhut (^ ^ ^ within blue one).

Bh ^ a l p ^ - C M A P L S ^ V X e 1 — * * * ~ % t
The usual name for Sm K (Mymensingh).
occasionally given as i M t ^ > : J ^ L i x bore th « « f *
samples that proved to be real J * * . * ^ i be most convenen*
In dealing with the variants, it ^ F

a the divisions are taken in detail- MttMfia rpur) the name
Tnnnm-In West Tirhut (S « » " J l h e r oddly, as, Ton,
is Bdi or I * , from Davbhauga it « sent, rom ^ n e a h i , , , 8 e ^
while W North Bhagalpur (Snpal) and ^ p a l ^ t ^ n a « e
« I U i M i or simply Bfth > f a t h e r inapplicable, of t -
(« it means "small ^ ") V ^ S a c e , bnt it was not at
kind sent was the short, smooth early * * » ^ w a s ^ f i n e B M a l l ,
* applicable to the Porneah sample ^ ^ m M o n g h ^ T h e £
late snbrace. The same name « « « J 0 ^ ^ ^ ily under
Wever, it is applied to Tori, a nsag

stand if the plant itself be what « thong W r t ^ ^ three
Wt subraces are sent and are c ^ w i l y ^ g ^ : tall late
« Ed » rough early « ^ ^ / ^ . T h e " r o i g n « f ^ ^
^ m Arrah the tall late is not « n t . * o r t e a - i n e f o r m e r -
"smooth early" are, * * * ? * * ? * * £ name W - (^ r f f)
D « w f c R d i , the latter as ! . * » B < H . 1 9 a

Eolution of different names

is not particularly applicable to any *Bdi*, though it is used also in Bankura; there, however, for the * rough early,' not the * smooth early,' As we shall see, the name is generally employed to indicate *Tori*. From Patna 'tall late' comes under its proper name *Bdi*, and the same subrace is sent from Monghyr, but under the names *Gota* or *Tori*. If *Gota* means "entire," it is not easy to see how it is applicable in this connection. The same name is used with a sample of 'rough early *Bdi*'⁹ from the Sonthal Parganas.

ORISSA.—The name sent with a sample from Angul of^c tall late *Bdi* is *Ghota Sarisha*. The *Bor Sarisha* sent from the same place is the dwarf *Tori*; the names therefore apply to the seeds, not to the plants. The plants of this *Bdi* were 5 feet high, and were twice the height of those of the *Tori*; the seeds on the other hand were, weight for weight, *Tori*, 34 = *Bdi*, 60 or thereabouts.*

No explanation of this discrepant usage of *Bor* and *Ghota*, or of the similarly discrepant application of the names *Bdichi* and *Tofh* has yet been suggested. It is just possible that where the diminutive term is applied to the *plant*, the expression of oil from the seeds is a local industry that absorbs the whole of the seeds there grown; the seeds being a purely domestic article receive an attention subordinate to that bestowed on the plant. In districts where the seeds of mustard are grown for export, these as the commercial article, receive an attention to which that given to the plant, as such, is in a manner subordinate. It need not necessarily follow of course that *present* conditions should in every case bear out this suggestion.

Coming now to Bengal Proper, we find that the same state of confusion prevails.

WEST BENGAL.—From the Sonthal Parganas all three kinds are sent and, as is Shahabad, each is distinguished by a special name, As at Bhujpur, so here "tall late" is known as *Bdi*, 'rough early' is sent as *gota* (the name used for "tall late" in Monghyr), and * smooth early' is known as '*Man Sarisha*,⁹ perhaps meaning "our own special mustard." Bankura sends only 'rough early,' and sends it as *Lutni*, which is really the Chota Nagpur name for *Tori*; Burdwan sends two samples of the same * rough early' subrace, one of them as *Bdi* which is an accurate enough usage, the other as *My* or *Maghi*; this last, we shall presently find, is the East Bengal name for *Tori*. Midnapore does not send the 'tall late' subrace at all, but sends both the others, distinguishing the

* The actual numbers in a tolah of seed of the original samples were *Tori* (*Bor Sari8ha*) 3,360; *Rdi* (*Ghota Sari8ha*) 6,908.

to different Mustards in Bengal,

'rough early' as *Mi Sarisha* and the 'smooth early' as *Moria Sarisha*.
 Hoo g h y sends two samples of 'tall late' *Bai*; one as *Kala Saris to*, a term used in contradistinction to *Shweti Sarisha*, generally employed in Bengal for white-seeded *Sarson*; the other as *Jun* interesting as being the name reported long ago by *Roxb*. From the 24-Parganas comes a sample of 'rough early', under the name *Kazli Sdrisha*, a term again used with reference to *the* but *if* *the* *name* occurs also in North Bengal, *IS* *ere* restricted to *Tori*. From Jessore come two samples *as re* *xate* with names that repeat exactly the Burdwan usage *th* *gards* 'rough early' for one is properly termed *Bdi*, while for *used* *other* the name *Mdghi* (restricted in East Bengal to *Tori*) is *iro* " «*adia* sends 'smooth early' as *R&i*, and *Murshidabad* sends *rest* *igh* early' as *T<ht Sdrisha*. This term *TM* is in North Bengal *No* *ed* to *Sarson*.

BENGAL.—*Purneah* sends both 'tall late' and 'rough early' samples are most unaccountable, for the 'early' and 'smooth early' subrace is termed *Rdi* 'the <cter>, very tall kind' is *termed B& chi*. The sample named *Bai* is from the *Sadar* sub-division; *Arraria*. All the other divisions send samples: in every case these belong to the 'tall late' subrace and in every instance they are correctly named *H&*.

EAST BENGAL.—The samples from all the districts except *Tipp* were *are* *ridpur*, *Mymensingh* (*Sadar*), *One* (*Jamalpur*) came as *Li Sdrisha*, and *Backergunge* (*Surnadi*) as *Kala Sdrisha*, thus *repea* *Hoo ghly*. A sample from *Mymensingh* was sent *Bs Moghlai Sdrisha*; it differed in no respect *from* *the* *sample* sent as *Bdi*. The same name recurred in *Tippera*, *the* *name* applied to a sample of 'rough early.' Curiously *early* *the* *only* of *the* *sample* from *Tippera* was this same 'rough early' subrace, and it was named *Bdi Sdrisha*.

RECEIVED
 a *mixt* *gong* under the name "Small *Mir*" The sample was *The* *of* *the* 'rough' and the 'smooth' early subraces. *other* *me* *reference* to *the* seeds apparently, for the only *the* *sample* sent from *Chittagong* as "Mustard" was also a mix-
most *it* *consi*sted of a plant unlike any other Bengal mustard, and *resemb*ling European "Colza," with ordinary *Tōri* in about

Relation of different names

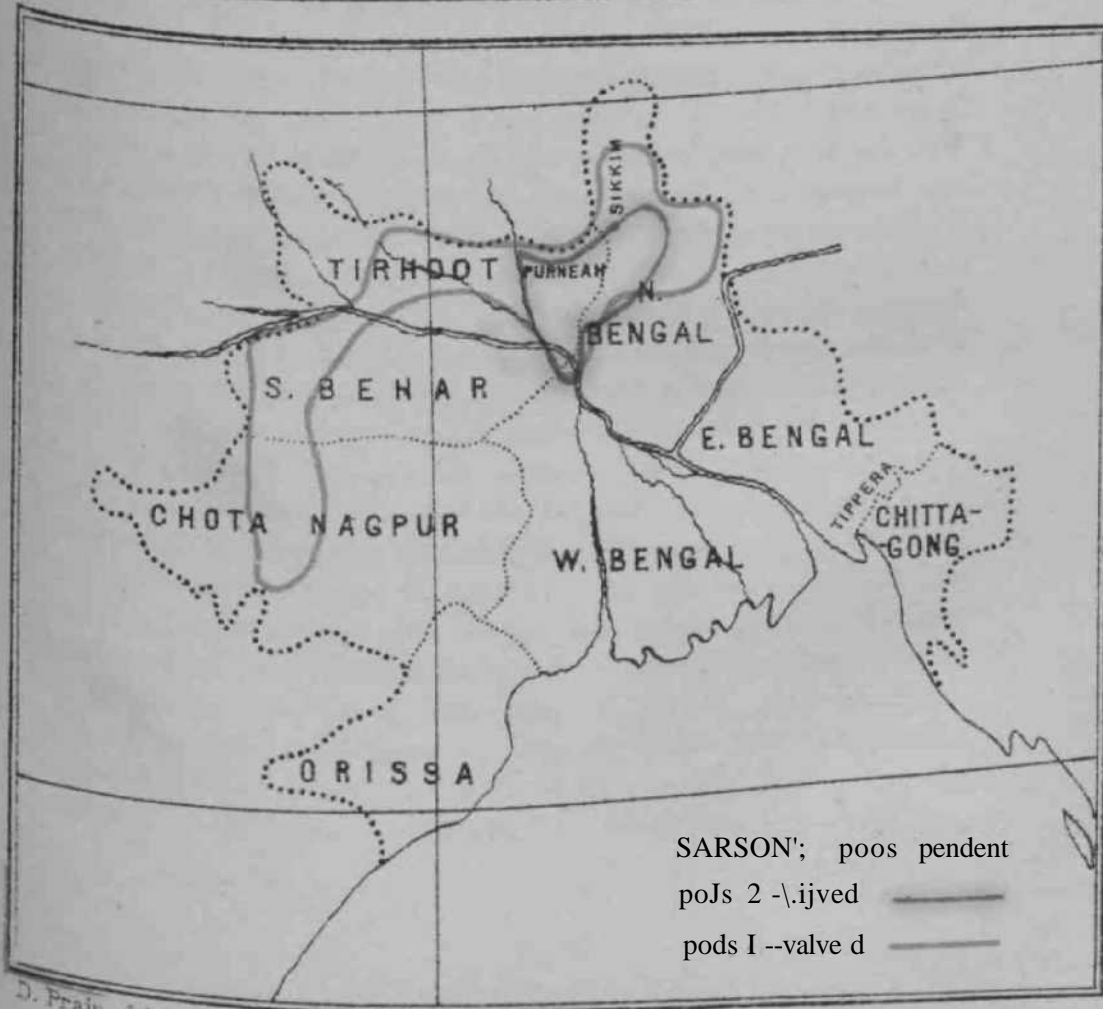
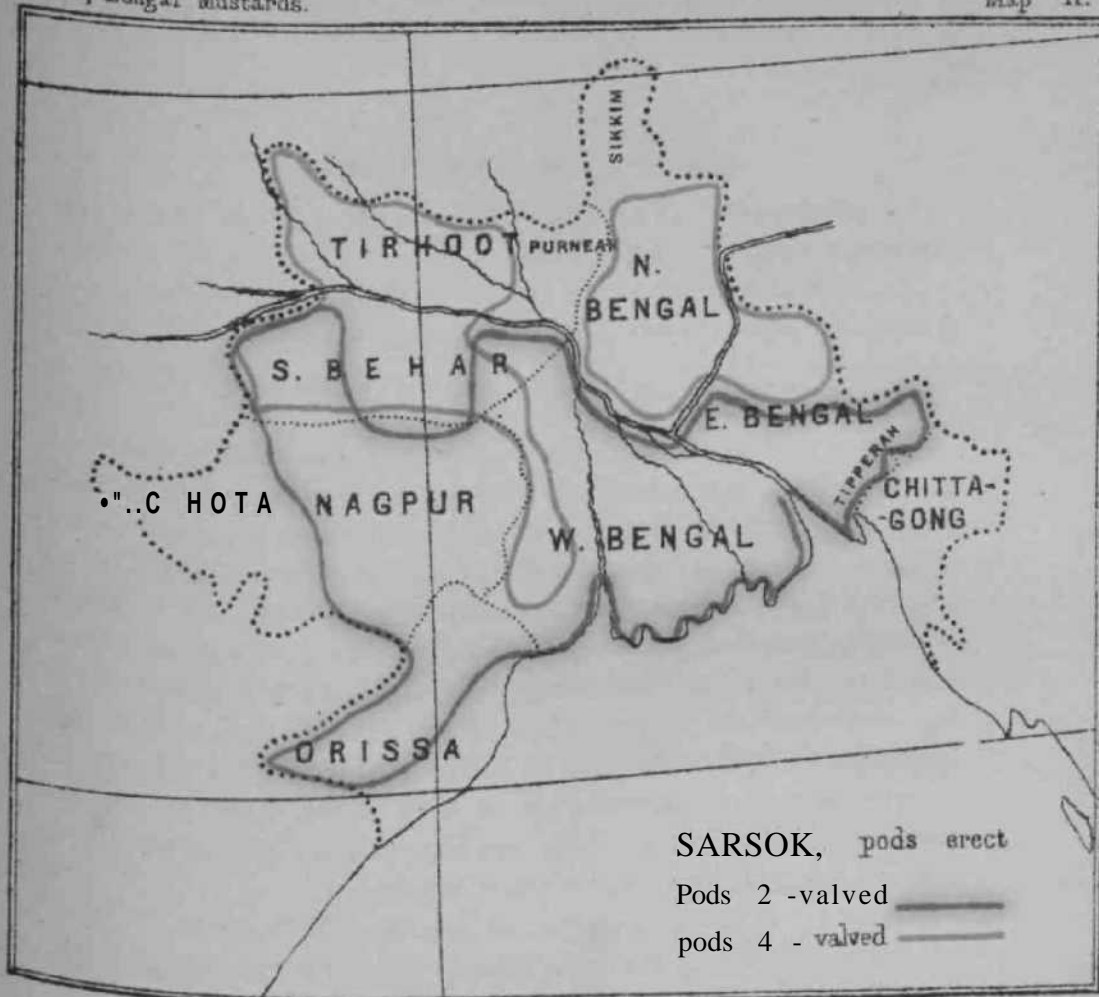
equal proportions. The seeds of the two are very similar, **and** are larger than the seeds of *Bdi*

2. *Sarson*, in one form or another, seems to be grown everywhere throughout the Lower Provinces except in Chittagong. It is there replaced by the plant that it seems impossible to separate from true "Colza."

Sarson with pendent pods is, however, very little known or grown. It is, in the two-valved state, restricted to Purnea and Jalpaiguri in North Bengal, crossing the Ganges into the Sonthai Parganas (MAP II, SECTION B, area within blue line). In ^{*tB} 4-valved state this race occupies the same area as the 2-valved, but extends eastward through the whole of Rangpur and northward into British Sikkim (Kurseong subdivision), while it occurs also in the extreme west of our area, in the districts of Shahabad and Palamau (MAP II, SECTION B, areas within red lines). In the intermediate area, Muzaffarpur. etc., it **only** occurs as a mixed crop along with erect 4-valved *Sarson*. It has not been sent at an from Western Tirhut (Saran and Champaran).

Sarson with erect pods is the race usually met with. In ^{its} two-valved form (Roxburgh's *Sinapis glauca*) it extends throughout the whole of Ohta Nagpur, Orissa, West Bengal, and East Bengal, including Tippera, but excluding Mymensingh (MAP I ^f SECTION A, area inside blue line). The only district of South Bihar from which it has been sent is Shahabad. In its 4-valved form *Sarson* occurs in Western Tirhut and South-Western Bihar; while absent from the eastern half of Tirhut and from **South-East** Bihar it recurs in North Bengal, where it extends from **Dinajpur** and Rangpur across the Brahmaputra into Mymensingh (MAP H ^f SECTION A, area within red line). The two subraces between them thus occupy almost the whole of the Lower Provinces without, however, their areas overlapping, except in the district of Shahabad in South-West Bihar, where the two 2-valved Bengal and Chota Nagpur plant crosses into Bihar; also in a narrow strip along the west of Bengal, since one finds that the samples from Monghyr, Bankura, and Burdwan down even to Midnapore yield mixed crops of erect 4-valved and erect 2-valved. The gap between the two areas occupied by 4-valved erect-fruited *Sarson* is to a large extent filled by the pendent-fruited 4-valved subrace.

Unlike *Rdi*, which is cultivated under the same name throughout our area, *Sarsdn* is known by different names in different Divisions. The name *Sarson* is used throughout Tirhut, South Bihar, Ghotia Nagpur, and in a modified



to different Mustards in Bengal.

form in North Bengal, but it is quite unknown in Orissa, or in any part of Western or Eastern Bengal. The divisions may again most conveniently be taken in detail.

TIRHUT.—Only the 4-valved erect-fruited subrace is grown; always as *Sarson*.

SOUTH BIHAR.—In Shahabad the 4-valved erect and the 4-valved nodding subraces are *Natua Sarson* and *TJlti Sarson* respectively. In Patna the 4-valved erect is *Sarson* also. From Gaya two samples of the same subrace were sent—one from Manghiawan subdivision was

Sarson, one from Pariya subdivision was named *Tōra*. A fine sample sent from Shahabad (Bhujpur) of 2-valved erect-fruited *Sarson* deserves especial notice. One of these samples, with

Very thin L. j pods, to outward appearance like those of the 4-valved race, but with the pods really only 2-valved, was termed *Jowda*

with other three forms, viz., one with large yellow seeds one with medium yellow seeds, one with large brown seeds, were termed *Tōra*, *Piarki Tori*, *Lalka Tōra* respectively. Here, again we

as a synonym word *Tōra*, sent with one of the Gaya samples, used freely as *Sarson*; and its use with the yellow-seeded forms—large, *Tori* for the small-seeded—may indicate the

same name *Tori*, which is so commonly applied to the Indian race, the usage is not always precise, for even in the present

to be sent from Bhujpur a *Lalki Tori*, corresponding to *Lalka Tōra*, it turned out, as has been already explained

Of Indian Colza. A sample from Monghyr, sent as *Sarson*, though mostly 2-valved, had some 4-valved mixed with it.

Hazaribagh NAGPUR.—From Western Chota Nagpur—Palamau, Lohardaga—the clean samples were all termed *Sarson*, sent from Hazaribagh as *Bdi* proved to be a mixture

of equal parts of *Tori* and *Sarson*. From Manbhum a sample of *Sarson* was sent, but without any name; from Singhbhum sent as "*Rdi*," was a mixture of *Bdi* and *Sarson*.

The sample of *Sarson* sent was named *Ganga Toria* as the name is intended to compare the colour of the seeds with the Ganges' stream.

Other.—From the Sonthal Parganas were sent two other 2-valved *Sarson*—one as *Tharia*, the other as *Sdrisha*, while a pendent-fruited sample came, only, as *Purbi* (or "Eastern") *Sdrisha*. From Manbhum only, as *Purbi* (or "Eastern") *Sdrisha*, came two samples, both mixed—erect 2-valved and erect 4-valved. *Oae* was named *Seti* or *Piyala Sdrisha*,

Relation of different names

the other *Bdi* or *Jhanti Sdrisha*. As the two were identical, it is possible that the second name was sent by mistake. The other samples from West Bengal were sent as *Sheti* or *Sheti Sdrisha*? with the exception of two from Midnapore, which came as *Sheti Bdi* and *Sadha Bheta Bdi* respectively. These are very interesting samples as being the only ones in which *Sarson* is deliberately termed a *Bdi*, for the two occasions on which the name *Bdi* is associated with samples containing *Sarson* that came from Chota Nagpur must obviously be discounted as the result of ignorance, *Bdi* being practically unknown in Chota Nagpur and the one occasion in which *Sarson* was sent as *Bdi* from Bankura was clearly a mistake. The interest is heightened because this is the vernacular term reported for *Sarson* by Roxburgh, both in the *Hortus Bengalensis* and in the *Flora Indica*. According to Roxburgh the name *Sheti Sarisha* was applied to *Eruca sativa* at the beginning of the century. This name is certainly more usually applied now to *Sarson*. But it need not be concluded that Roxburgh was mistaken; he very rarely was, and it is interesting to find that the usage reported by him still prevails in Midnapore. The sample termed *Seti Eāt* was 2-valved; the *Sadha Bheta Bdi* was mixed 2-valved and 4-valved.

NORTH BENGAL.—The name *Sarsoo* accompanied samples of pendent 4-valved *Sarson* from Purnea and Kurseong; the same subrace from Rangpur was sent as *Sheo Sarisha*; the same name from Jalpaiguri was, however, sent with *Toṛi*. Pendent 2-valved came from Purnea as *Tara*, from Jalpaiguri as *Swet Sarisha*. From Dinajpur the name *Tefō Sarisha* accompanied erect 4-valved; erect 4-valved from Rangpur was sent as *Dhēpd*. From Rajshahi the sample sent as *Seti Sarisha* was mostly erect 4-valved though there was some 2-valved erect mixed with it.

EAST BENGAL.—Erect 4-valved, which extends into Mymensingh* was sent from Jamalpur subdivision as *Dhupi Sarisha*, and from Netrakona under the usual Bengal name, *Sweti Sarisha*. From all the other districts only erect 2-valved *Sarson* has been seen from Dacca under the West Bengal name, *Swet Sarisha*, but from Backergunge as *Makhun Dhane Sarisha*, and from Noakhali and Tippera as *Dhone Sarisha*.

3. *Toṛi* is grown in every one of the Bengal Divisions. Of the two subraces, the taller and later seems to be unknown in East Bengal and Chittagong, while the shorter and earlier is not sent from Western Tirhut. Both are sent from every other Division, and indeed from most of the districts of the Lower Provinces. Strangely neither sort has been sent from Shahabad in South Bihar, or Chapra in Tirhut,

to different Mustards in Bengal.

that is to say, from the districts west of the Sone and the Oandak. The name *Tōri*, which is here used to designate the "Indian *fape," is, like the name for *Sarson*, quite arbitrarily selected as the one by which it shall be known. The reason for adopting it is that it is a familiar word in Hindi-speaking districts. It is, however, in our area used only in Tirhut and South Bihar, and, altered *o 2W*, occurs in the districts of North Bengal nearest to the Terai. In Chota Nagpur this is the mustard known as *utni (dwarf); in Orissa and Western Bengal it is the plant known especially as *Sarisha*; in East Bengal it is the plant known as *Mdghi* or *Mdghi Sarisha*, owing to its ripening in *Mdghi* (January-February). There are, however, especially in Western Bengal a number of variants, which will be most easily dealt with if the divisions are considered in detail.

TIRHUT.—From Champaran the taller sort was sent without a name; from Muzaffarpur and Darbhanga it came as *Tōri*. The variety of North Bhagalpur and Purnea was on the other hand the shorter earlier variety.

SOUTH BIHAR.—From Monghyr the Western Tirhut form was sent but the name given was *Bdichi*; from Gaya the shorter earlier form characteristic of North Bhagalpur and Purnea was sent as *Tōrim*. It is *o ^e noted therefore that while both forms receive in Tirhut the name *Tōri*, this name in South Bihar is restricted to the more dwarf form, the other receiving a name which in Eastern Tirhut is applied to a form of *Rdi*. A consultation of ²⁴ ^o ⁶ ¹ ^U ^{Aug-11} ¹ ^{valent} ^t ^{for} ^{Rai}. As has been already shown, the mistake is not that of the author, but of the people themselves; the sample received from Darbhanga was sent as *Tori*, and when Roxburgh, 90 years ago, had a figure of this mustard made in the Calcutta Herbarium, he experienced the very difficulty that has been met with by Grierson and by the writer; on the figure of his *Sinotoma*, Roxburgh has himself written the following note:—

Urtica ^o ^{WC} ^{*} ^{*} or *Shorshi* about Calcutta; *Toree* about Purnea; the *ertam* because *ramosa* and this came up equally plenty from the parcel of seed sent by Dr. Fleming under the name *Toree*. ^o ^{*} ^{*} ^{*} whether is this or *ramosa* 'Toree' ? "

CHOTA NAGPUR.—In most of the districts of this Division, it is known as *Lutni* (dwarf). It is applied to samples of the taller form from Lohardaga, Palamau, and Singhbhum. The sample so named from Hazaribagh was the shorter earlier

Eelation of different names

sort. This earlier sort came also from Singhbham, and is evidently there distinguished as *Chota Sarisha*. Here the adjective applies to the plant, not, as was the case when the same name came from Orissa, to the seeds. The name *Lutni* passes beyond Chota Nagpur eastward to the adjacent districts of Birbhum and the Sonthal Parganas, in both cases being used for the proper plant; it also extends to Bankura, but is there misapplied to *Bát-*

ORISSA.—This is the commonest of the Orissa mustards; i^{*waS} sent as *Sarisha*—the usual term in Bengal proper; as $\xi\acute{a}to$ *Sarisha*—a name used in Bengal for *Edi*; and as *Bor Sarisha*^{ft} name used, because of its larger *seeds*, to distinguish it from $t\acute{u}^{al*}$ which in Orissa is termed *Ghota Sarisha*.

WEST BENGAL.—In the Sonthal Parganas both kinds are known: the taller is sent under the Ghota Nagpur name, *Lutni*; tn^e shorter under the East Bengal name, *Mdghi*. In Birbhum only the short kind is known, and it gets the two names, *Lutni* and *Mdghi*, as alternatives. The name *Lutni*, it will be recoUected, occurs also in Bankura, but is there misapplied to *M&i-* From Burdwan, but from nowhere else, the name *Sanchi*, interesting as being one of the names used by Roxburgh in the *Flora Indict* accompanied a sample of the smaller variety. The simple name *Sarisha*, that given by Roxburgh in the *Hortus Bengalensis* and used as an alternative (*Shorshi*) in the *Flora Indica*, was sent with the taller sort both from Nadia and from Murshidabad. From Murshidabad another sample of the taller sort was sent as *Jema* (edible) *Sarisha*; one of the shorter sort from the same place was sent as *Bhati Sarisha*.

A Midnapore sample of the shorter form is termed *Sadharan Saw** *sliā*; possibly Roxburgh's third alternative name, *Sadha Rayee*, which is altogether meaningless as applied to *Tori* (*Sinapis dichotoina*), $**\sim$ since *Tōri* is not a *Bdi*, and is not white (*Sadha*),—may be hidden in the word *Sadharan*. A sample from the 24-Parganas had no name.

NORTH BENGAL.—The Purnea name *Tōri* appears as *Toori* from Dinajpur and Siliguri in connection with the same short subrace of *Tōri*, the taller form being Bent from Dinajpur with $t^{\wedge e}$ ordinary Bengali name *Sarisha*, and from Siliguri with the name *Kazlia*, which is used again with one sample from Rangp^{ur} (Kurigram subdivision). Another Rangpur sample of the taller sort" (Nilphamari subdivision) is sent with the Eastern Bengal name *Mdghi Sarisha*. The same name is given with a sample of the shorter sort from Jalpaiguri, the taller sort, as sent from Jalpaiguri, receiving the name *Sheoa Sarisha*—a name applied in the adjaceufc

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district of Rangpur to one of the forms of *Sarson*. From Mai da the Wler sort of *Tōri* was sent under the ordinary Bengal name *SunsJia*. Under the same name were sent samples of the shorter sort from Eajshahi and Pabna respectively.

EAST BENGAL.—All the samples from East Bengal were of the shorter sort of *Tōri*, and all were termed *Mdghi Sarisia*.

CHITTAQONG.—Here too the only kind of *Toñ* known is the short-stemmed subrace. But it was sent in one case mixed with the plant that seems to be European "Colza," and that replaces, though it certainly is not a form of, *Sarson*. The name given to this mixed sample was simply "mustard," no vernacular term being sent. There were other two samples from Chittagong, both of them unmixed: one was sent with the Bengali name *Sarisha*; the other was sent as "reddish rape."

SECTION VI.—DISCURSIVE CATALOGUE OF THE NAMES APPLIED TO THE MUSTARDS OF BENGAL.

In the preceding chapters it has been considered better to use the names given with the samples as they were received at the Sibpur farm. But Dr. Hoernle, who has had the great kindness to look over the original list, has pointed out that the transliterations sent from the various districts are not always correct, More over, the vernacular characters have not in every case been sent and in one or two instances there appears to be something wrong if vernacular spelling. In the present list, for convenience of reference has been made purely alphabetical an attempt is made to show the proper spelling. The writer would here wish to express his very warm thanks to Dr. Hoernle for help in connection with this catalogue which he has prepared and has enriched with many notes.

Bhāṭī sarifd, (Sadr). This term comes only once, from Murshidabad (Sadr). It is applied to *Tōri*, and the significance of the term is rather obscure. If *bhāṭī* here means, as it generally does, "bellows," the name would apply, with some force to either of the 4-valved *Sarsōs*, and especially to the erect-rudded subrace PLATE VII, figs. 2-6), but as applied to *Tōri*, it does not convey any particular meaning. One might have supposed that there was some mistake about the incidence of the name had any 4-valved *Sarsō* been grown in Murshidabad; but Murshidabad is quite outside the 4-valved area (MAP I, sections, red areas). Can the name be in use anywhere

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within the 4-valved area ? This is just possible, and it is also possible that the people of Muishidabud may think they have the "bellows-fruited" *Sarsō*, but are mistaken. Instances of similar mistakes will be indicated further on.

Perhaps a confirmation of this explanation of the meaning is to be found in the use of the same word with reference to *Sola*.ⁿ comparing true *Sola* (*Aeschynomene a<tpera*) with the woody *Sola*, *Kāṭṭi-Sola* (*Sesbania paludosa*) our country-people often, instead of saying *Sola* and *KUth-Sola*, compare them as *bhSfh-Sola* and *Kāṭṭi-Sola**. The idea, however, underlying the use of the word here is not the shape, but the softness and compressibility of the *Sola* stem, as well as the fact that when squeezed tight the air inside it, if it be compressed under water, escapes in bubbles, It does not, however, seem clear that the word '*blāfi*' is ever ua^{eti} for the "bellows" as such in Bengal proper.

Bhētā rāi (crotgf*); see *Sadha blēlā rāl*.

Bhūfi(4fiF) > *Bhunri* of previous chapters. A term received only from Hooghly (Jahanabad) and applied to *Tōri*. The name is evidently used in contradistinction to *Jhuni*, the local name for *Bāi*. It is said to mean "(mnstard) preferring a light soil." The words do not appear to be indigenous Bengali terms. The present one is applied to a kind of *awnless* wheat in South-West Bihar^r (Grierson, *Bihar Peasant Life*, p. 213, § 956); it is also used of *hornless* bullocks (Grierson *he. cit*, p. 289, § 1107).

Bar Sariga (991 GSṭQfl). This term is only once used; * comes from Angul in Orissa. It is applied to *Tori*, which, as a plant, is really much the smallest of the three Bengal mustards. The name *Chtyā ṣarigH*, from the same district, is applied to *Mh* which is the tallest of the three, but which has much smaller seeds, so that one must conclude that the relativity expressed refers to the seeds, not to the plants. Even then the explanation is not altogether satisfactory, since *Sarsō* is sent from the same district, and *ṣarsō* seeds are rather larger than *Toti* seeds. In the present instance only 3,180 *Sarsō* seeds went to one *tola*, as against 3,360 *Tori* seeds.

• NOTE BY DB. HASUNLE.—The "bellows" theory is very plausible. UV objection as a philologist is that bellows is spelled either *bhdthl* (HT[^]) with *Sentalth* (as Grierson has it, section 4H) or *bhathi* (VT[^]) with cerebral *ft* (as Bate's Dictionary has it). In any case, the *th* is aspirated, while *your* word is spelled *bhdfi* (W^T3) without aspirate.

The objection is not insuperable. Occasional instances of *t* for *th* are found. The figures certainly suggest bellows.

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The *Bāi* sample, however, had 5,908 seeds to a *tola*, and was thus manifestly smaller-seeded. Both *Rāi* and *Tōri* are brown-seeded, the *Sarsd* being white-seeded. Perhaps, therefore, the cultivators on V^{co}napare the two first, mentally as well as verbally.

Chōf & Sariḡa (eg* GQIQEI).—This term is used twice; in one case^{Se> *rom} Orissa (Angul) it is applied to *Rai*, and is therefore clearly employed with reference to the small seeds; in the other case^{Se} from Singhbhum (Chyebasa) to *Tori*, and is therefore clearly employed with reference to the size of the plant.

Dh̄c̄pā Sarifā (cs*t\ *rfr<t1); used once, from Rangpur, with a sample of erect 4-valved *Sarsō*. The meaning of the term is not clear; it is said to be the same as *Goētā*, and means, therefore, light^{Se}-coloured (white or yellow). The sample consisted of four-fifths⁸ white, one-fifth brown-seeded.

tiēpō Sēti (ci? *t1 criS); apparently the same word as the preceding^{ing J} used once, from Burdwan, with a sample of erect 2-valved *Sarsō*.

If, as has been suggested, both the words are the same in meaning^{ing} the term may be intended to imply 'very white' or 'pure white';^{Whit*} in this instance the seeds were all white.

Dh̄ Saripa (t ^ ^fr¹¹) J used twice[»] from the adjacent districts^s of Tippera and Noakhali. The Tippera sample was a clean lot^{ne} of erect 2-valved white-seeded *Sarsō*; the Noakhali one was

mixed with about 10 per cent, of *Rai*. The name was in both^{both} cases transliterated *Dhone*; the meaning possibly is dhan^{an} ianya) «ffood, auspicious/ or the word may be the *Skr.* **Wl* m^{a>} ^ an ^ kⁿ (* o ^ cōrnor ffr^a ^ nⁱ

Mym^{ku} I>iḡariga (%fH 7ffirt\)-, once used, with a sample from of^{w, e ns ^ n ^} (Jamalpur), which was a mixture in equal parts['] of white and of brown-seeded erect 4-valved *Sarso*. The name intended to represent the idea conveyed by *dhup* (v¹? =¹ essence), and indicate that the odour of the oil is of a superior quality.

Dh̄ ara S&i.—This name was sent from Shahabad (Arrah) without^{a Vern} a vernacular spelling. The mustard so named was^{*} the 'rough ca^f brace of *Rai*. *Diara* is the name given in West Bihar to^v fresh land thrown up by the shifting of the course of a river" (G^{if} l^{*son}, *Bihar Peasant Life*, p. 162, § 788; the adjective is h^{ppl}ied to crops grown on such land.

Gatā (t ^ ^) - This name is twice^{Renfc} onco from Mon¹, ghyr, with the alternative name *Tōri*, and again from the S^onthal Pargannas. It is apparently a very local name; its

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meaning is not clear. In *Bihar Peasant Life*, p. 246, § 1055, Grierson mentions the name as applied to *Sarsō* in the form (*^oṭ^o) (South Bhagalpur), and also (North-East Tirhut) in the form *Gṛt*. Oddly in neither case was the sample *Sarsō* as given Grierson ; it was not even *Tōri*, as suggested by the officer who sent the Monghyr sample. Both were *Bāi*, the Monghyr sample being the "tall, late;" the Sonthal Parganns one the "rough early" subrace. One native informant says that *Oṭā* mea^s "entire, or the reverse of broken" ; if so, the term is not particularly apposite. Grierson, however, in another passage gives *g* (^oṭ^o) as a term used in the Gaya district in a general collective sense for "seed." If this be the meaning, the usage here is perhaps parallel to the use of the term *Dhanfi*, in Tippera and Noakhali-

Oangā Tariyā Sarigā (ffin SQdl GSIIQSII).—This expression is sent with a sample from Orissa (Angul). The name may reference to the colour of the seeds, comparing them to the colour of the Ganges. But the sample was mixed with white-seeded *Sarsō* and *Tōri*; so that if this be the explanation, it is not to which of the seeds the term applies. *Tariyā* is apparently local variant of *Tōrd*., *Tōri* (*q. v.*).

Jauda Sarsō.—A name sent from Shahabad (Arrah).^{w^orlt the} vernacular character. The form was a *Sarsō* with erect pods, thick and swollen, as in the 4-valved kinds, but with the pods nevertheless normally 2-valved and with a complete partition dividing the fruit into two chambers. The meaning of the term has not been ascertained.

Jemō Sariqd, (^oṭ^oṭ^oṭ^o ifiMI) ; sent as *Jema*. only once received, from Murshidabad (Kandi). The mustard was pure *Tōri*. Some of the writer's native informants suggest that *Jemō* mean "edible;" if so, the word does not appear to be a Bengali one.*

JhṬṭi Sariga; Bāi or (*^oṭ^oṭ^o *^oṭ^oHi).—There is some confusion about this sample, which came from Bankura (Vishnupur) along with another termed *Sefi* or *Piyāṭ Saritfi*, and a third termed *Laṭni*. The *SBṭi* was, as a matter of fact, the same as the *Shet* of Bengal generally, common *Sarsō*; but so was the present sample. The sample termed *Laṭni* (which is the Chota Nagp^{lir} term for *Tōri*) was in reality a clean sample of rough early *R8* and not *Tōri* at all ; while the sample termed *Bāi* had no *Bāi* in it. Still it is not impossible that the term sent with the present sample

* NOTE BY DR. HCERNLE.—Quite possible. In Sanskrit (जेमन्) *jēmana* means "eating," "food." Hence Hindi *jēvand* to eat, *jēvan* eating. I have found *jēman* applied to a kind of "spiced fritters."

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¹⁸ really applied for *R&i*, not only because that name itself is used, but because the alternative name is most applicable to *Rāi*. So far * can be learned, *Jhūti* means "branched/" with the further implication that the branches lie close to each other and to the main stem, which is exactly the case with *Rāi**

Jhuni (*yrft*).—A term used for *Rāi* in the immediate neighbourhood of Sooghly, Howrah, and Calcutta, but of which no one knows the meaning. It possesses the interest of being the name applied by Roxburgh to the same plant, which is his *Sinapis ramosa*. It is possible that it had originally the meaning that *Jhūti* bears, and that Roxburgh's name "ramosa" was suggested by this fact.

f'djaU (*^Sffir*); twice used : once from Rangpur and once from Sibguri. Though the name is the same as the following, the usage is different, for both samples were *Tōri*; in North Bengal therefore *Kdjali* seems to be used as *Kātu* is used in Orissa; not altogether, however, for two samples of *Tōri* were sent from *S'U'ri**. One of them (the taller later kind) carefully marked *^ajāh*, or "purple" *Sarifd*, the other (the shorter earlier sort) marked *Toori*, or "black" *Sarigā*.

K'ali *SoriQfc* (*^Ftwf'r TfHi*); once used, with a sample from the *^* arganas of common *Rāi*. The name in the neighbourhood of *^*utta is therefore synonymous with *Kola* (black),

fo *^ā* *^antf*⁵ (*^ ^ Tir*H*); used three times; not however, uniformly. It has reference to the dark colour of the seeds in each *^* out with a Cuttack sample it indicated *Tōri*; with a sample *di* *^oo guly* (Serampur) and another from Backerganj it indicated *Rāi*.

Lāhi; *Rāi* or (*srfft*).—A mere variant of the word *Rāi*, used as an alternative for a sample of that mustard from Chapra. *Lāfo sāg*; used in North Bengal for one of the "Cabbage-mustards."

Lalka Tora; *Lalhi Tori*.—The adjectives indicate the colour of the seeds; *Lalka Tora* was a brown-seeded *Sarsō*, *Lalhi*

* NOTE BY DR. H. (ERNLB.—) *Q*uiteso. The usual form in Hindi is *jhdf* (*झड़*) which means a twig or sprig; and is a common emblem (mint-mark) on coins of native states.
 * NOTE BY DR. H. (ERNIE.—) Your suggestion might be correct. There is a word *Jhur* *OTi* or 5huQt* or *jhunī*, which means "shrub, bush, bramble;" most synonymous with *jhdf* or *jhānfī*; and *jhurf* might form into *jhunl*.

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Tori was *Rāi*: The terms *Tora** and *Tori* are dealt with further on. It may be noted in passing that though both these plants came from the Dumraon Experimental Farm, neither the one nor the other was the actual *Tori* of the cultivator.

Lanqri.—A. term sent, without vernacular characters, from the Dumraon Farm with a mixed sample of "tall late" and "rovg* early" *Rdi*. The name, if it be used in the ordinary sense (*laine*), has no obvious significance.

Li Sarishā.—A. term, of which the vernacular form was sent, that accompanied a clean sample of tall late *R&\$* Mymensingh (Jaraalpur). Like *Lāhi* it seems a mere local variant of *Rāi*.

Latni (sifrīT).—This term by itself accompanied six different samples; was given as an alternative name with a seventh, & in the form *Lutni Rāi*, accompanied still another. The word means "dwarf," and the sample termed *Latni Rāi*, which came from Arrah, was the short 'smooth early' subrace of *Rāi*; the name was thus fairly applicable. It is not, however, to *Rāh* to *Tōri*, the shortest of our three Bengal mustards, that the name *Latni* is usually applied. As employed throughout Chota Nagpur in Hazaribagh, Lohardaga, Palamnu, and Singhbhum, it applies only to the mustard which is termed *Tōri* in Tirhut and *Māgni* in Eastern Bengal. The use extends beyond Chota Nagpur, however, for one of the samples so named is from the Sonthal Parganas, another is from Birbhum, and the last is from Bankura. Outside Chota Nagpur there is a want of definiteness in the use. Thus in Birbhum the same sample, which is really *Tōri*, is termed "Latni or Maghi," i.e., both the Chota Nagpur and the East Bengal names are used in preference to the Bihar name *Tōri* or the Bengal name *Saripā*. In the Sonthal Parganas too, where *Latni* and *Maghi* are used, they are applied to different samples, both are *Tōri*, but the Chota Nagpur name is restricted to the taller kind, the East Bengal name to the shorter, more early ripening sort; and in Bankura the name is misapplied, for it accompanies *Rāi*. As has been already explained, however, the name *Rāi* is given to a Bankura sample of *Tōri*, and the chances are perhaps greater that a mistake has been made by the sender of the samples than that the cultivators do not know *Rāi* and *Latni* (*Tōri*) when they see them.

Maghi Sarigā (Ttfa Tflrti).—This name was used with ten samples. Seven of these, from Rnngpnr, Myracnsingh*

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Dacca, Faiidpur, Backergunge, and Tippera, indicated *Tōri*, and in all, except the Rangpur sample, the shorter earlier kind of this mustard was what was sent. In no case was any alternative name sent, and it may therefore be taken as the usual, if not the name for *Tōri* throughout Eastern Bengal. The name occurs in western districts also. Thus it is used in the Sonthal Parganas exactly as it is in East Bengal, for the shorter sort of *W*, the Chofca Nagpur name (*Lafni*) being used for the taller sort; while it is used in Birbhum as an alternative name with *Lntni*, again for the shorter kind of *Tōri*. But though the name "fy&i" *Sariga* is sent also from Jessore, it is there quite misapplied, it is used with the tall late subrace of *B&i* that does not ripen after *Mdgh* (January-February) is over. From Burdwan the term *MdgM* accompanies the rough early subrace of *Rāi*; though opening before the Jessore sample, this also, at least at Sibpur, does not ripen till after the end of *Māgh*. As applied to *Tōri*, specially the shorter earlier kind, the name is particularly appropriate, that being the earliest to ripen of all the Bengal mustards.

M&i (*rf*); used only once, for the sample just mentioned, from Burdwan, as an alternative with *MSghi*. The plant was roughly *Iidi*, and the name may be only a local variant. The curious thing is that the name *R5i* came from the same village with another sample of the same 'rough early' subrace.

Makhin dana Sarigci ("srfr *ri *rit").—A name sent from Barisal with a clean sample of erect 2-valved white-seeded *Sarsō*; it describes the seeds well.

Mā Sariga (Trt* *rfHi); sent from the Sonthal Parganas (Māra) with smooth early *Rāi*. The name is apparently equivalent to the "our own special" of the European advertiser.

Mdri Sariḍ ("srj *rifK1); sent from Midnapore with the same *aooti* early *Rār*, which is the least common of the three subraces in the Lower Provinces. The meaning of the term is not clear.

Mdgtlcli Sariga (^^rtt *rfHi); used twice: once from %mensingh, once from Tippera; in both cases for *Rār*. The term is said to mean *ltRai* introduced by the Moguls.* It is very common in Eastern Bengal especially, the prefix for any plant obtained from Upper

* NOTE BY DB. HOJRNLE.—This explanation is plausible enough. Only the vernacular is spoiled Magalni, *rith a, instead of o or u. The Moguls or Moguls are never called "Magals." The quite proper form is *Moghul*,

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India. In West Bengal it is at times used as a synonym for anything of western origin, even if it be European.

Natwa Sarsø.—This name was sent from Arrah along with the erect 4-valved white-seeded *Sarsø* as opposed to the 4-valved with pendent pods, which was termed *Uti Sarsø*. The appositeness of the latter name is obvious, but the meaning of the other is not altogether clear. *Natwa* is in Bihar the skeleton bamboo "winder" on which the weaver's thread is wound; and the name is also applied to a stunted bullock, possibly because of his bones showing through the skin like the ribs of the winder through the yarn; by transference *Natwan* applies also to people in poor health or in poor circumstances. But the meaning in the present case is perhaps direct, for the pods of this kind of mustard are not unlike a "winder" when covered with thread. It can hardly be intended to convey the indirect meaning of poverty, because this happens to be one of the finest kinds of *Sarsø*.*

Paliari Rçit, Palai, Palavgi.—These three terms are used as alternative names for the cabbage mustard with coarsely-toothed leaves which is cultivated in Sikkim and elsewhere in the Himalayas. It was sent to the Sibpur Farm from Kalimpong merely as *Rçit*.

Piarha Tora; Piarhi Ton.—Names received from Dumraon Farm. The English equivalents given were "Bold yellow rap" and "yellow rape." Both were erect 2-valved white-seeded *Sarsø*; the first a very slightly branched and very late sort with exceedingly large seeds, the second was the sort that has been sent from most of the districts of West and East Bengal as *Seti ov Sheti*. The names, just as was the case with the *Lalka Tora* and *Lalki Tori* sent from the same place, refer to the colour of the seeds. The yellow sorts were, however, both *Sarsø*, whereas one of the brown sorts was *Sarsø*, the other *Eai*.

Piyala (or *Sa(i) Sariga* (*f*frtal, c^ *rfHi*).—An alternative name sent from Burdwan for erect 2-valved *Sarsø*, of which the seeds were 90% white.

Purbi Sarishā.—This name was received with a sample of pendent-fruited *Sarsø* from Bajmahal. As this is a form of the mustard not uncommon in North Bengal, but practically

* NOTE BY DR. HCERNLB.—*Natwn*, properly *natwa* 'dancer,' is a very good descriptive name, if it is taken from the "winder." The latter turns or 'dances' when the weaver's thread is wound on it, and is appropriately called the "dancer."

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unknown south and west of the Ganges, the name doubtless indicates that it has been introduced from the eastward to the Rajmahal district.

Rāi or *Rāi Sariga* (?rft, ffft *rīr*tt).—This is one of the important names sent. In the substantive form (unqualified) it was sent with twenty different samples, and in 15 of these it applied to *Rai*. These fifteen came from Patna, Gaya, Dumraon, Muzaffarpur, Chapra, Purnea, Malda, Sonthal Parganas, Burdwan, Madhupur, Jessore, Murshidabad, Rajshahi, Jalpaiguri (Phalkota), Mymensingh. In the five remaining instances it was more or less misapplied. The Kalimpong sample, termed *Rāi*, was the long-misunderstood *Sinapis rugosa*, the cabbage-mustard of Nepal. The Pabna sample was a mixture of *Rāi* and *Tōn*, but this mixture is quite as likely to have been the result of carelessness in the sender as of ignorance in the cultivator. The Hazaribagh *Rāi* was, however, *Tōri*; the Bankura *Rāi* was *Sarsō*; the *Rāi* of Sinbhhum was a mixture of *Sarsō* and *Rāi*. The explanation of this confusion in Ohta Nagpur and Bankura seems to be that *āi* is practically unknown throughout these areas,

As a substantive, the name *Rāi* was sent five times; two of these, **rom* *rah*, viz., *Diara Rāi* and *Lafni Rāi* (this latter not to be confounded with *Latni* proper), were really *Rai*; so was a sample sent from Chittagong as "small *Rāi*". The *Shat Rāi* of Bidnapore was, however, *Sarsō*, the *Sāda Bhēta Rāi* of this district, a mixture of *Sarsō* and *Tōri*.

The *Rāi Sariga* form *Rāi Sariga* accompanied seven samples, from Bidnapore, Muzaffarpur, Jalpaiguri (Deviganj), Dacca, Faridpur, Bioker-

Reoffunge, and Tippera. In each case the sample was *Rāi*. It applied to the incidence of this name, no dispute is possible, and as said by Hooker and Thomson, to *Sinapis ramosa* (*Brassica juncea*), as said by Hooker and Thomson, to *Sinapis glauca* or *S. glauca* (*Brassica campestris*).

Rāichi (rā'chi).—This term, a diminutive form of the preceding, accompanied four samples. Its incidence is not uniform, one of the samples, termed *Rāichi Rāi*, received from North Bengal was one of the shorter subraces of *Rāi*, but the sample from Purnea, termed *Rāichi*, was tall late *Rāi*, and as it happens of the tall *Rāi* Planf8 in the whole field! The *Rāi* of North Bengal and the *Rāichi* of Monghyr were *Tōri*; as applied

that the name is restricted to Eastern Bihar (Bliagalpur

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Division), and that the people use it for different plants in different districts.

Ścida Bheta Rai (*rtifl cw | ?rtt).—This name was received from Midnapore. The term *Bheta* is said to be applicable to anything ¹ round ' or ' globular,' and may allude to the fact that the sample contained erect 4-valved fruited plants with thick swollen pods; the seeds being white explains the use of *SadSi*. But there is nothing very definite about the sample, since it was a mixture of this erect 4-valved *Sarsō* with *Tōri*, which does not have thick pods or white seeds.

Sātlhāraṇa Sarifa (*rtifl Jrfirt).—Sent once from Midnapore with a clean sample of *Tōri*. The name means "common mustard." The chief interest of the name is that it appears to explain the term *Sada Rayee*, which is one of the names given by Roxburgh for *Sinapis dichotoma* (*Tōri*). No one has been able to understand why Roxburgh should have given this as a name for *S. dichotoma* since its seeds are never white, and whatever name it may receive, it never is termed *R&i*. The writer, at least, is satisfied that *Sada Rayee* is simply a mistake for *SadharU*.*

ChhŪchi (^tffc).—This name only came with one sample, from Burdwan. The plant was *Tōri*; this name too possesses the interest of being one of those applied to *Tōri* (*Sinapis dichotoma*) by Roxburgh. The name means "genuine," "excellent," "first class," in the sense in which these terms are used by a European advertiser.

Sariga (*rtf'fl).—One of the most important of our terms, being the Sanskrit *Siddhārtha* (fa^TTW) and verbally the Hindi *S<i'** (W%of) or *Sarisō* (*ft§f). It is usually supposed to denote a light-coloured variety of mustard, *gveta* (%?T), but it is interesting to find that this, whatever it may be elsewhere, is not the usage in Bengal. In a single instance, from the Son thai Parga sample is sent as *Sarigəl*, which is actually as well as verbally the same as *Sai-sō*, and has therefore white seeds. But the other samples with which the name has been sent (from Chittagong, from Puri in Orissa, and from Nadia, Murshidabad, Rajshahi, Pabna, Dinajpur, and Malda in Bengal) are in every case clean samples of *Tōri*, the Indian "Rape,"¹⁹ a brown-seeded mustard.

NOTE BY DB. HCBRLB.—I think your suggestion is probably correct, that *Sadd Bdi* is a mistake for *Sadhāraṇa*.

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The various qualified uses of the word *Saripō* are recorded throughout the list, and need not therefore be alluded to here.

The form in which the name is given by Roxburgh, who applies it accurately to this mustard, is *Shurshi* in the *Flora Indica*, *tiurisha* in the *Hortus Bengalensis*.

In connection with this point it is interesting to note that in botanical papers *Sarigā* usually is taken as denoting a variety of mustard with light-coloured seeds.*

«O. *Sarsā*, *tiarsn* (sftlj, WCT, TO&).—Though verbally identical with the preceding, this name is applied to a quite different plant. We have seen that on one occasion the name *Sarsā* was applied to the *Sarsā* plant; but though the name is without any qualification with eleven different samples, *Sarsā* is not in a single instance used for the plant that in Bengal proper is known as *SariQfi*. The forms *Sanō* and *Sarisō* occur throughout Chota Nagpur, South Bihar, and Tirhut, being sent from Lohardaga, Hazaribagh, Monghyr, Bhagalpur, Gaya, Patna, Saurian, Muzaffarpur, and Daibhanga, the form *Sarsu* occurs in Andhra and at Kurseong.

On three other occasions the name occurs in a modified form—*Sarsō*, *Natua Sarsō*, *UUi Sarsō*; all three are forms of the white-seeded mustard here described as *Sand*.

It is strange that, although there is just as little doubt as in the case of *R&i*, as to the plant to which the name applies, both Roxburgh and afterwards Hooker and

Scholars may have good reason for what they say on these matters, not from the botanical, but from the linguistic point of view.

In Sanskrit the terms *Sarisā*, *Sanō*, *Sarsu* do not exist at all. The only term which exists there is *sarsapa* (W9) of which (and this point is quite certain) *Sam*, etc., are more proper forms. Now, in

Sanskrit *sar?apa* is a "class" name, not a specific; it signifies a variety of plant which is like the ordinary mind (though probably not to the extent of varieties are distinguished in Sanskrit by adding specifications, such as "white" or "not white," etc. A pandit, or Sanskrit scholar, simply states the Sanskrit usage of the term, which must have been

in use in old times, and at all times, to the people of the country in which it is a common plant. Further, a point of linguistics: Sanskrit words in the vernacular forms in the vernacular: (1) a similar or (2) a dissimilar.

of *Saripā* the two forms are (* to *Sar*, (2) *Sar* to *Sm* in the vernacular forms are specialised and applied to different varieties (I use "variety," not in the botanical, but linguistic sense) of the class *Sar*, more or less specialisation of vernacular forms in different parts of India; thus the usage in Bengal is not the same as in the Panjab.

Discursive list of names

Thomson should have misapplied it. They do not use it for the same plant, however. Roxburgh uses it for *Tōri*, a mustard to which it is never applied in the Lower Provinces; Hooker and Thomson use it for *Mi*, a plant to which it is not applied anywhere in India. The mistake in the latter case has, however, as already explained, been merely the result of the transposition of two passages that are otherwise quite accurate.

Setiy Sheti, *Sheti Sarisha*, *8/ieti Bai*, *Sivet Sarisha*, *Sweti*, are local modifications of the same name (Jvōta, (\$?JT) applied throughout Bengal to the mustard that in Bihar and Chota Nagpur is termed *Sarsō*. The name refers to the fact that the seeds are white; it never occurs outside Bengal Proper, just as the *Sarsō* never occurs within that province. The name is used often substantively as adjectively. In the latter case it is once associated with *Rdi*; this happens with a sample sent from Midnapore. All the other instances of adjective use accompany the word *Sarisha*. It is interesting to note that it is this very uncommon usage which is recorded by Roxburgh, for he gives *Shwet Bai* as the native name for his *Sinapis glauca*.

Seuijā Sarigd, (OTani ifirti)—transliterated *Sheoa* and *Shewa*—is a name sent twice from North Bengal. In one case, Rangpur, the name is applied to *Sarsō*; in the other, Jaipaiguri, it is used for *Tōri*. What the meaning may be is clear. The word is applied in Bihar to the briard of wheat and millet; its appositeness here is not evident.

Tērō Saripā (c&ntf *r**n) sent as *Tdrd* from Purneah, *Tdró* from Dinajpur, and *Tharia* from the Sonthal Parganas. All three *Sarsō*, and the name, if it means, as the writer's native informant explain it does, " the opposite of straight," * is very apposite to the Purneah sample, that being the *Sarsō* with curved stalks and down-turned pods. But there is some doubt about this in the writer's mind, for both the Dinajpur and the Sonthal Parganas samples had up-turned pods with straight, erect fruit-stalks.

Tdrā, *Tōri*, *Turi* (cfrtai, cfrfir, ^).—This is one of the important names. The form *Tōrēt* is very rarely employed.

* NOTE BY DR. HCERNLE.—*Tiro*. I agree with this. *Tero* is Sanskrit *tiryak*, which means " oblique, transverse, horizontal; crooked, curved." It is applied to animals, as walking " horizontally" compared with the erect position of men.

for Mustards in Bengal.

When it is used, it is applied always to *Sarsō* or Indian Colza (*S. glauca* Roxb.). The diminutive form *Tōri* is, on the other hand, in common use in Bihar, and there it usually indicates the Indian Rape (the *Lntni* of Chota Nagpur, the *Sariga* proper of West Bengal, the *Māghi* of East Bengal).

The *Tōra* of Gaya was *Sarsō*, so were the *Lulka* and *Piarka Tōra* of the Dumraon Farm; so too was the *Qangā Taniyā* of Orissa, at least in part.

The *Tōri* of Muzaffarpnr, Bhagalpar, and Parneah were *Tōri*, so were the *Turi* of Siliguri and of Diiijapur. But the usage is not altogether uniform in Bihar, though it seems to be fairly so in Upper India; for the *Tōri* of Darbhaugaand of Monghyr were both as was also the *Lalki Tori* of the Dumraon Farm. The *P. wrlici Tori* of that institution was on the other hand a *Sarsō* with rather smaller seeds than the *Sarsō* sent as *Piarka Tora*.

The Waning of the names *Torā* and *Tōri* is not clear. Grierson (*Bihar Peasants' Life*, p. 172, § 823) quotes a rural rhyme of the *Sanscrit* in which *Tori* is translated "oil-seeds." Perhaps all the meaning the words usually convey whatever their origin of *oil-seeds* discrepancy in the usage with the diminutive form *Tōri*. Generally applied to Indian Rape, which is as large as those of *Tōra* (*Sarsō*) but with the seeds much smaller, it is at times used for *Rāi*, which is a larger plant than *Sarsō* (*Tōra*) but has much smaller seeds. I have already seen the same discrepancy in the use of *Qangā* in Siughbhum and in Orissa respectively.

The *Qangā* in Bihar (sent from Arrah along with, and in connection with, *Natwa Sarsō*). The name was applied to 4-valved *Sarsō* with hanging pods, and its meaning is therefore clear.

* *Nōri* BY DE> HCERXLB.—Your word *Tdṛā* (JliTT) puzzles me. Your principal words are *Tōrū*, *Rdi*, *Sarsō*. The two latter I know well, and have their equivalents in Sanskrit. But *Tōm* I never heard of outside of Bihar and I am curious that it should not be mentioned at all in Grierson's *Qr Peasants' Life*. We (if I except his *Tōri* in §§ 1045 and 823). Nor do I know *Sarsō* in Sanskrit. Do j'ou happen to know what its equivalent in Hindi is? Nor can I find it in any dictionary, Sanskrit or Hindi. It seems extraordinary that vernacular dictionaries should not mention it at all (whether in any correct or incorrect sense), if it is so common and widely.

Summary.

SECTION VII.-SUMMARY.

In the Lower Provinces three very distinct mustards are generally cultivated:—

RAI, or Indian mustard, the most important of these, is grown in all the provinces except Chota Nagpur, where it is practically unknown, though it seems to be cultivated to a slight extent in Singhbhum. It is easily recognized by having none of its leaves stem-clasping; and, after reaping, its seeds, which are brown, can be readily distinguished from those of *Tori*, or Indian Rape, by their smaller size, their being distinctly rugose, and being reddish brown all over. From *Sanson*, which has white seeds or, less often in Bengal, brown seeds, it is equally easily distinguished for *Sanson* seeds are always considerably, often very much larger, and even when brown have the seed coats smooth.

There are three subraces, a tall late kind and two shorter earlier kinds, one of those roughish with bristly hairs, the other smooth with darker coloured stems. The tall sub race is quite absent from Chota Nagpur and from Tippera and Chittagong. The shorter subraces are quite absent from Orissa, and are absent from North Bengal except Dinajpur, and from East Bengal except Tippera.

The name *Rai*, occasionally *Laid* or *Li*, once also *Mai*, occurs everywhere except in Orissa, where this mustard is termed *Ghota Sarisha* (*chota*=small, with reference to its seeds). In various districts other names are locally applied, either alone or as alternative native names for Eat. These will be found discussed in § 37. The term *Rāi Sarisha*, the word used as an adjective instead of as a substantive, takes the place of the more usual form *Rāi* throughout Eastern Bengal.

Tour, or Indian Rape, the next in importance, is sent from all the provinces, though it is not reported from the north-western districts (Saran and Shahabad) of Bihar. It is easily distinguished from *Rai* by its stem-clasping leaves and its smaller size; when reaped the seed is recognized as being larger, though of the same colour, and by having a paler spot at the base of the seed; the seed coat, too, is only slightly rough. From *Sanson*, or Indian Colza, it is easily distinguished by its smaller size and by its leaves, though stem-clasping, as in *Sanson* being less lobed and having much less bloom. The seeds are of much the same size in *Tori* and in ordinary *Sanson* but as a rule the seeds of *Sanson* in Bengal are white. When *Sanson* seeds are brown they are of an umber colour, and have no paler spot-

Summary.

The ^{the Sc}en poat, too, is smooth. The seeds of *Sarson* are *sometimes* considerably larger than those of *Tori*. When this is the case the ^{tw} are easily distinguished.

There are two kinds of *Tori*—a taller, rather later, and a shorter, ^{the i}early kind. Both kinds, however, ripen well ahead of any ^{1 op a} *Sarson*. The earlier kind of *Tori* does not appear to ^{occur in} North-West Tirhut; the later kind is unknown in East ^{the en}gal or in Chittagong, elsewhere both sorts prevail throughout ^{the} Lower Provinces.

^{the} *Mustard* is known as *Tori* in Bihar and the northern ^{the} districts of North Bengal, *Lntni* in Chota Nagpur and the drier ^{the} parts of West Bengal, *Sarisha* in Orissa, West Bengal, Central ^{the en}gal and the south-western districts of North Bengal, *Magki* ^{the} the south-eastern districts of North Bengal and throughout ^{the} *the* Bengal. The Bengal name *SarishS* recurs in Chittagong.

^{the} *Ch*-ARSON, or Indian Colza, occurs in every province except ^{the} Chittagong, where it is replaced by a different mustard. It is ^{the} distinguished from *Rai* by its stem-clasping leaves and ^{the} tall ^{the} *Tori* by the greater amount of 'bloom' on its foliage, by its ^{the} shorter stature, its more rigid habit, and its thicker plumper pods. ^{the} When reaped the seeds are distinguished by their usually white ^{the} color ^{the} when brown the seeds are distinguished readily from ^{the} those ^{the} of J&K by the larger size and the smooth seed-coat; from ^{the} those ^{the} of *Tori* by their being paler brown, and not having a paler ^{the} spot at ^{the} the base of the seed.

There are two races—one with erect pods, the *Natwa Sarson* or ^{the} proper, and one with pendent pods, the *TJtti* or *Tiro Sarson*. ^{the} These are ^{the} two distinct subraces—one with 2-valved, the other ^{the} with ^{the} 4-valved pods.

^{the} The ^{the} *Mustard* with hanging pods are not common except in North ^{the} and East Tirhut (Purnea), the subrace with 2-valved pods ^{the} being ^{the} confined to this area. But the 4-valved kind extends sparingly ^{the} through Western Tirhut, and crossing the Ganges spreads ^{the} ^{the} through South-West Bihar and Western Chota Nagpur. ^{the} The ^{the} *Mustard* with erect pods practically occur everywhere: the ^{the} 2-valved subrace, however, is little known in Bihar, though it is ^{the} grown ^{the} both in Shahabad to the south-west and Monghyr to the ^{the} south-east. It extends over the whole of Chota Nagpur and over ^{the} Orissa ^{the} West, Central, and East Bengal. The 4-valved subrace ^{the} occupies ^{the} West Tirhut, and West Bihar, extending thence sparingly ^{the} through South-East Bihar and along the dry parts of West ^{the} Bengal, as far south as Midnapore. It also occupies North Bengal

Summary.

and the northern part of East Bengal (Mymensingh), to the exclusion of the 2-valved subrace. Roughly speaking therefore, the 2-valved erect subrace is characteristic of Chota Nagpur, Orissa, West, Central and East Bengal: the 4-valved erect sub-race is characteristic of the western half of Bihar, and again of North Bengal, while the pendent subraces occupy the region between the areas to the north of the Ganges occupied by the erect 4-valved subrace.

The name *Sarson* prevails in Chota Nagpur, in Bihar, and in extreme North Bengal. In Bengal Proper this is the mustard known as *Sweti Sarisha*, or simply *Sweti*. In Orissa it is *Gangatoria*.

There are two other field-mustards cultivated. One of these, confined to Chittagong, seems to be a form of the true or European Colza; the other, or Nepalese mustard, is the same as the Cabbage-mustard (not to be confounded with the China Cabbage; of Chinese cultivators. This latter is sent from the Dacca district only. From the same district comes a garden-mustard *Bhutia Rdi* which is not distinguishable from the European Sweet Rape, while another garden-mustard, *Laid Sag*, is grown throughout North Bengal; this last is a Cabbage-mustard, in habit very like, but still quite distinct from the Nepalese Cabbage-mustard.

As regards the relationship that our three staple mustard-oil crops bear to the corresponding crops in Europe, it may be tentatively held:—

(1) that *Rdi* (*Brassica juncea*) is a crop not grown in Europe at any rate on a commercial scale,* but that it takes the place here of *B. nigra* and *B. alba*, which in turn are not grown in India;

(2) that *Sarson* (*B. campestris* VAR. *Sarson*) is a crop not grown largely, if at all, in Europe, but that in India it takes the place both of *B. campestris* VAR. *oleifera* and *B. Eapa* VAR. *oleifera*, which in turn are hardly ever met with here : finally

(3) that *Tori* (*B. Napus* VAR. *dichotoma*) seems to be the same plant as *B. praecox* (Sumtner-rape), or if not the same is at least very like and very near it, and is undoubtedly the plant that in India takes the place both of *B. praecox* and of *B. Napus* VAR. *oleifera*.

* [It appears that *B. juncea* is grown to some extent in Russia.]



Route Map of LIEUT. POTTINGER'S JOURNEY NORTH-EAST OF BURMA.

L. Uvt, Pottinotr't ftenb
Print* Kmr* ofOritantT Jltvtv
Htigh* infiti, apprxima-tt tinly

E. **r** GEE, Lieut., R. A.

A NOTE
ON
THE BOTANY OF THE KACHIN HILLS
NORTH-EAST OF MYITKYINA.

By *E. POTTINGER and D. PRAIN.*

§ I.—INTRODUCTORY.

[*E. POTTINGER and D. PRAIN.*]

to *N February 1897 Lieutenant Eldred Pottinger, R.A., sent a man
bot the Royal Botanic Garden at Calcutta to be trained to collect
^ an al specimens, and was supplied from the Herbarium with
join yin k 6 1111 e * C 11 P n o r A o A S departure for Rangoon, where he was
Cor ¥ lieutenant Lawrance, 3rd Seaforth Highlanders, in whose
fro JV? a J ourne y was made in the Kachin Hills during the period
ArCh 1 2 June 6, § 97.

inte rya. s t o the A A A cut A A Herbarium, where they were determined by
Dr P r a i n . The present note has been prepared conjointly from
the M e present note has been prepared conjointly from
pofic e i u 1 o A e s acc ompanying the specimens collected by Lieutenant
bllt n o e r s party and from the identifications effected at Calcutta;
for th it shal (* be understood that Dr. Prain accepts all responsibility
j n e c o n c l u s i o n s Verifications and for the phytogeographical deductions of
not e and * or A e s i c e t c A o f t h e chapter. For the route-map that accompanies the
his e and * or A e s i c e t c A o f t h e vegetation of the country traversed by
aibl part A , A e u t e n a n t Pottinger, on the other hand, is alone respon-

so T t at the specimens collected during the expedition are neither
^ c o n i p l e t e nor so numerous as could be wished, is largely due to
to L Unfortunate fact that the party was attacked on May 23 and had
of th u C a t a h a s t y r e t r e a t , a b a n d o n i n g at the same time the greater part
w e t e b a g g a g e . From this date forced marches during continuously
weather were necessary, and time for the collection and

preservation of many specimens was not available. During this period, however, Lieutenant Pottinger from time to time noted the presence of various plants; these have been included in their P^oP^o place in the systematic census of Kachin Hill species; in order to obviate any possible error they have not, however, been used as a dis[^] in the passages wherein the affinities of the Kachin flora are square cussed. To this end, all such references are enclosed in s^{serial} brackets and the species in question have not been accorded a number.

Lieutenant Pottinger's contribution to our knowledge of the Kachin flora has not, however, been confined to the making of the collection during his journey. While passing through Myitkyina, he was so fortunate as to enlist the sympathies of Lieutenant Cruddas, S.C., Commandant of the battalion of Frontier Police stationed there, on behalf of the Royal Botanic Garden. With much kindness Lieutenant Cruddas undertook to look after and assist in every thing in his power, a native collector belonging to the Garden establishment. This man, Shaik Mokim, thanks to the help and care of Lieutenant Cruddas, has been able to send at intervals during the expedition a most interesting collection of specimens from the vicinity of Myitkyina itself, and from the neighbourhood of the various outposts held by the force that Lieutenant Cruddas commands. He has also accompanied Lieutenant Cruddas during tours made in the course of his official duties, collecting by the way. The specimens thus obtained, having been mainly collected during the months subsequent to the termination of Lieutenant Pottinger's expedition, largely augment the Kachin list, and assist us greatly in forming a general impression of the nature and affinities of the flora of the region. All the specimens obtained during Lieutenant Pottinger's expedition are indicated by (E); those subsequently collected by the Garden collector are marked (C).

§ 2.—THE VEGETATION OF THE KACHIN HILLS.

[E% POTTINGER.]

Myitkyina, the starting point of the expedition, is situated on the right bank of the Irrawaddy, in a well-watered plain stretching eastward towards Mogaung. A large portion of this plain was formerly devoted to rice-cultivation, but wars between the Burmese and the Kachins, about 1882, devastated the greater part of the country which has consequently reverted to jungle. As a general rule this jungle is very dense, and is often impenetrable owing to the under-

growth of low shrubs, creepers, and prickly palms. There are a few teak trees, but of stunted growth, especially near the river.

The same kind of jungle exists on the eastern bank of the Tawaday, but becomes wilder and denser as one approaches the hills in March and April, owing to the dry heat and the jungle-fires, but few flowering plants are seen.

The temperature in the shade reaches a maximum of 108°Fh . in the hot weather, and a minimum of 35°Fh . in the cold weather; the annual rainfall is about 100 inches.

From Namlao northwards the country is very mountainous and as the river flows into the 'Nmai Kha. As far as the Nmai Kha these hills are fairly well peopled, and owing to the 'gyah' or 'jhum' system of cultivation that prevails, no jungle with large trees is to be met with, except in a few of the steepest ravines and along the banks of some of the rivers. In this 'gyah' tract the ground is usually tilled about once in seven years; in the region around Tawlang, near Lat. $26^{\circ}38'\text{N}$., about once in four years.

Under Sadfin frost occurs in the cold weather, the maximum temperature being there about 5°Fh . in the shade, snow has never been known to fall except on the higher hills over 9,000 feet. The native collector attached to the party ascended 300 feet, from Sadfin, reporting dense bamboo and jungle almost to the summit, but no pines or firs,

North of the Chi Kha the hills become much steeper and only the river valleys are inhabited, the higher hills being covered with dense virgin forest. The expedition was unable to halt at any one place for a sufficiently long time to admit of collections being made in the forests, the only track ran through the zone of cultivated or fallow 'gyah' land, and it was impossible to deviate from it to reach the virgin-jungle beyond.

Two high ranges of mountains were crossed; the first about 9,000 feet high in Lat. $26^{\circ}22'\text{N}$. and Lon. $98^{\circ}38'\text{E}$.; the second about 9,000 feet in Lat. $26^{\circ}12'\text{N}$. and Lon. $98^{\circ}40'\text{E}$. On both ranges the vegetation was much more luxuriant on the southern than on the northern slopes.

On the first-mentioned range the summit was covered with coarse grass; for about 3,000 feet down the sides there were large fir trees, but no pines; in this neighbourhood no quantities of a wild garlic were met with. Unfortunately specimens could be taken either on this range or on the second. Where the same fir was met with extending to the summit, on the southern slopes near the sources of the Nachawng Kha, a beautiful

variety of *Calanthe brevicornu* occurred in great quantity. flowers of this were placed in a note-book along with a description

The staple crop throughout the Kachin Hills is rice, this supplemented by Indian corn, pumpkins, vegetable marrows, and runners, such as *Dolichos Labi a b*; bringals, small tomatoes and chillis are also grown to a slight extent in most villages, one village, Wadze* bok, these small tomatoes were found growing freely in a semi-wild condition. During two seasons' experience Sadfin some years ago the writer tried peas, broad beans, kidney beans, potatoes, cabbages, cauliflowers, beet-root, lettuce, celery, asparagus, radishes; all were found to grow fairly well. A kind of red ant, however, attacked the roots of most of the plants, particularly those of turnips, which were in consequence continuous failures.

Ground for cultivation is cleared as follows:—A patch or having been selected, the smaller trees are felled and the large ringed during the cold weather; the whole is then set on fire in March or April. The larger pieces of half-burned felled timber afterwards removed, and the surface of the ground is broken by means of small hoes, so that the ashes are mixed with the soil. It is commonly supposed that land is allowed to lie fallow for from one to seven years, because the soil is so poor that it will not yield another crop. It seems, however, that the true reason is after one crop has been reaped the land, being exposed to the wind becomes self-sown with so many species of forest-grasses and weeds that these defy all efforts to eradicate them, and would inevitably choke any crop that might be planted the second season. The land is consequently allowed to lie fallow till the tree-jungle has become large enough to displace the herbaceous growth; it is then a comparatively simple matter to clear away this tree-jungle. In sowing a line of men and women start from the foot of the hill and work upwards. By means of a stick held in the right hand small holes are made in the ground and the seed, dropped in from the left hand, then roughly covered up. Weeding is carried on continuously during the time the plants are about six inches high. Both red and white rice are grown.

No wet paddy cultivation was met with north of Kwitu except in the Nachawng Kha Valley between the villages of Galing and Pelap; this last was entirely worked by Lashis. From Kwitu southwards wet cultivation is in the hands of Chinese Shans; buffaloes are

* This description is given under the species referred to in the systematic H.

... all their cereal crops

only the heads are taken ^{her elevation 8 (ge} ^{almost} ^{directly to the}
^{feet}
 in the valley; it gives place ^{above sea-level) rice}

following:—

1. Maize (*Zea Mays*)— ^{star (a itali ca).}
2. A small-grained rice ^{(B e Coracana).}
3. The marua or ragi ^{(Fagopyrum esculentum).}
4. Backseat

Close to every village were small gardens with plants of tobacco and cabbage-mustard, occasionally tea, less frequently opium. Pumpkins, and *catiang* beans, a garlic and a coarse radish were often found growing round huts in the "tongyah" clearings; *kachhu* too is grown in the majority of the villages. Tobacco leaves when plucked are half-dried in the sun, then finely cut and dried till they are sufficiently cut

assume a light yellow color ^{state j svnoked m^a Pj^e journey,}
 leaf while still green; ^{n^a s seen donng^t e Marust Old}
 mouth. Only ^{fl^e «^h w^a s confined among^e Among the}
 The smoking of ^{«* J J^s where[<]th to^{ew.} h^{AA} » not}
 people who have no teeth ^{and[^] chewing of^h »}
 Yawyins all the Ajuits smoke

indulged in: ^{.t.e.w a mixture w[^] tobacco and[^]}
 The [^] and
 Kachins ^{1[^] ^ ^ * » £%* *t'' '*}
 are probably both imported; at any

not ^{^ w c we, e me* w>th.}
 In the Kyeng-mo Kha, *Cannabis sativa* was found ^{in the}
 forests. [^] but the people appeared to have ^{knowledge of gt>i^a, and}
 no idea that this plant possesses narcotic ^{with a d^e}
 To obtain opium the poppy-head, when ripe, ^{» » wh[^], the cloth}
 and the exuding juice is wiped off on a piece of ^{and}
 coarse, saturated is dried and rolled up, the ^{required for £}
 earned about in this ^{water and b^o l^e over a fire after}
 into a small metal ladle ^{^ ^ e d . Plant in[^] p[^] ce » P[^] t* to}
 having been boiled the cloth ^{front} ^{Ql[^] fi[^] » ^ tity sufficient to}
 is shredded and toasted brown; ^{ig then} ^{ad d^e ^ ^ ned[^] the ladle, the}
 the leaf, finely cut tobacco ^{ium} ^{rtnta. or[^] obje^ct of the}
 absorbs the mixture of ^{w * * ^ Jsmok-ng-J^he / ovsran d over}
 resulting mass is rolled into ^{d the w[^] ^ ^ piece «}
 a cloth is to prevent waste, an

again till the last trace of opium has disappeared. The smoke is drawn through water as in a *hookah*. These details are given because an impression has got abroad that the cloth itself is actually smoked.

Tea is indigenous and was met with wild in the forest in various places, as at Lammuk and elsewhere ; it more resembles the Assam plant than the Chinese. At one or two villages a few bushes, as has already been indicated, were found planted, but no attempt is made to cure the leaves; these are picked green and boiled as required.

The castor-oil plant was found cultivated in villages near the British, and again near the Chinese, frontier, but was not met with in the more remote ones. The people grow the plant in order to express the oil from its seeds, though they only use this for burning and are quite unaware of its medicinal properties. In the upper valleys the people have no lamps and seem to have no idea of using any kind of oil, either for burning or for cooking.

A powerful spirit is distilled from rice, and several kinds of beer are brewed. The most usual beer, made from rice, varied with each brew and tasted somewhat like perry or cider; it is acceptable when one is thirsty, though the taste is usually rather mawkish. In the beers made from *Setaria* and *Eleusine*, arid in the Kachin Hills it seems to be the former that is usually employed, the grain is left in the fermented liquor, so that the result is a thin gruel of an uninviting appearance. It proves, however, to be a pleasant pick-me-up, without being at all 'heady' if drunk when one is heated and fatigued; it serves indeed to some extent as a food as well as a drink. Yet another beer is made from maize, but this was only met with among the Yawyins, though it is said to be prepared by other tribes also. This has a very pleasant flavour, but is strong and 'heady'.¹ All these liquors have a tendency to provoke rather than to allay thirst. In passing through a Maru village a malodorous substance of a dark-brown colour was seen drying on trays in the sun. This was found on enquiry to be the substance employed in fermenting these beers; it was said to be the product of the root of a particular tree, of which unfortunately no specimens could be obtained.

The "Seit" palm was fairly common, especially in the tract between Kwitu and the Tumpang Kha; its long pendulous clusters of fruits, which look like great chains of large beads, render it a very conspicuous object.* When bamboos are scarce, the rind of its stem

* From Lieutenant Pottinger's description this is evidently a *Caryota*; indeed, on being shown *C. urens* and *C. mitis* in the Botanic Garden On his return Lieutenant Pottinger at once decided that it must be very nearly related to these species, especially to the former, of which it has all the habits, though the pinnule of the leaves differ. Possibly it is *Caryota obtusa* Griff., originally obtained in [†] not far distant Mishmi Hills.—A P_m

is used for making house-floors and walls; a kind of waterproof coat, termed *LUkyeng* by the Kachins, is also manufactured from the very fibrous tissue just within the rind. Among the Nanwa *Mopus* the pith of this tree is boiled and eaten; the sago obtained is however very flavourless and did not seem highly nutritious; unfortunately no specimens of this tree were collected.

Besides the fibre obtained from the *Caryota* another fibre, apparently obtained from *Villebruneay* is used for making ropes. AH cloths manufactured by the Kachins are of cotton locally produced. Cotton is grown in small patches near villages; the ground is carefully prepared, all stones and weeds being removed; the seed is scattered loosely over the surface and driven into the ground by the heavy shower of rain. The surplus cotton crop forms the principal commodity exported to China in exchange for various Pessaries and luxuries.

A plant from which the inhabitants obtain Jheir dark blue dye is not cultivated. It seems to be found pretty generally in the virgin-forests, but the plant was never itself actually seen. When asked for it was always spoken of as growing some considerable distance away. Its use is common throughout the Kachin Hills and in many parts of the Shan States. It is apparently

A well-known *rim* of the Assamese (*Strobilanthes fiacidifolius*).

A considerable demand exists among the Chinese for a small plant, known in the higher ranges, which yields a yellow dye. No specimen could be brought away, though the plant was found in the mountains between the head-waters of the Liking Kha and the Nachawng Kha. Madder is used by the Kachins, but the plant itself was not seen.

No green dye seems to be known in the Kachin Hills.

Many places there were walnut trees, but the nut was usually hard and thick-shelled. Small apricot trees were met with, and a variety of *Crab-apple* (*Docynia indica*) was also seen. In the upper part of the Nachawng Kha, near Galing village, mulberry trees were met with at the end of May. Yellow and black raspberries and brambles were found at elevations above 3,000 feet, some of them being fairly palatable. A *Cinnamon*, either *Cinnamomum* or an allied species, the young shoots of which have the characteristic mon flavour and smell, was also met with, as was a Baer fruit (*Zizyphora*); the latter was very common but very sour-fruited. In the foot of the hills mangoes and jack-fruits, always occasionally met with, as were Htchis; once too the *Dill* *Kaki*, the *hig* were offered to the party. Two

or three species of edible wild figs were fairly common, but plantains are plentiful along the streams and on the lower hills, the fruit is full of black seeds and is uneatable.

Among the striking plants noticed were a white rose (*Rosa involucrata*), *Hydrangeas*, *Gardenias*, *Begonias*, and a very fine species of *Chirita* [*C. speciosa*]; *SLUO* balsams, honey-suckle, several jasmines, a clematis, and ivy. A holly, too, perhaps *Ilex dipyrj* was seen. In the hills above 5,000 feet several species of *dendron*, both red-flowered and white, were met with, and the (*Rhododendron formosum*) so common in the Khasia Hills, frequently met with in the Kachin Hills. A wild white and white violets were also fairly common on the high ranges of the Tumpang Kha, *Ficus elastica* is to be met with, but in any great quantity.

Orchids were very numerous throughout the area as might be expected, species of *Dendrobium* bulked large the showy forms. A fine variety of *Cymbidium eburneum* lected, and a beautiful *Calanthe*, common on one of the ranges, has already been alluded to. Two species of *An* were seen, also two of *Microstylis*, one of the latter being the same as a species common at Shillong in the Khasia *Cypripedia* were conspicuous by their absence.

Of cryptogams a *Lycopodium*, two distinct *Selagin* many ferns were seen; the most striking fern was *Osmunda* which is plentiful in the upper valley of the Nachawng Kha, which specimens could not be brought away.

Taking the line of the mountain range which runs more north and south in Lon. 98°33' E. and between Lat. 25.55' 26-28' N., it was observed that to the east of this line apparently *Pinus Khasya* were very common, while to the west it only occasional trees occurred; on the other hand, bamboo were seen to the east of this line. Above 4,000 feet only bamboo found was a very slender *Arundinaria*, which in flower and was not collected.

Bamboos are universally employed for carrying water, trays, small cups and flasks of all shapes and sizes are made

* Neither of the *Anaetohiti* or *Mierottyles* referred to occur among Pottinger's specimens; their identity cannot therefore be determined. The *Cymot* referred to is present, but though the specimen suffices to show that Lieutenant Pottinger's specific identification is correct, it is not in a condition to admit of varietal separation.

f Lieutenant Pottinger in reality transmitted specimens of three *Selaginett**

bamboos; ropes and withes too are made from bamboos; cords or utensils of cane fibre and the exceptions were the occasional rope and house-canes used for fixing bridges. The walls are usually made of bamboo, which are also used as granaries, as an outer covering for the thatch of dwelling-houses, but are situated some little distance from the straw of the thatch itself is always some grass of the same species is often used also for walking

the top. . . . manufacture of bows and arrows.

A special use of bamboos is in the manufacture of bows and arrows. The bow is a crossbow tightly strung with a vegetable fibre. The bolt is thin and light, made by paring down a bamboo stem; the feather is replaced by shavings of jam. The Marus do not poison their arrows, but they use any poison in their construction, though they sharpen the tips by means of fire. The head is of a piece with the shaft, a small circular groove is cut at the base of the head in order that it may readily snap off in a wound. The Yawyins use metal rods, moreover, they induced, an *Aconitum* Poison. Apparently, to judge by the plants used for the purpose; the plant its effect is obtained.

Spear-shafts are never made of bamboo, but the name iron-wood is given. The tree which is known as iron-wood of Assam is it not the same as that species which is met with throughout the journey. The ridge-poles, beams, posts and rafters generally of the houses are of various timbers, never of iron-wood. The houses consist of Marus often have no doors; the doors are made of single planks measuring roughly seven feet by three feet thick, hewn by means of axes out of solid logs.

At the more important ferries on the river, hewn out of single logs are in use. These are long by two feet across or thereby. rafts are used. The raft is thrown from a pair of banyan trees on one bank to a pair of banyan trees on the opposite bank during the journey, had these trees, almost the only banyans seen during the journey, had been, so the party were informed, planted

been, so the party were informed, planted

supports for this bridge ; their roots have been specially ^{tram ^} i to
interlace and so form natural arches over the approaches and ^{a ord}
a substantial support for the connections at either end.

The Itinerary of the expedition under Lieutenant Pottinger ^{may}
be most conveniently given here.

Name of camp.	Date.	Height above sea-level ft.
Myitkyina	22nd March 1897	45°
Namlao	»	2,000 n
Bansparao	»	2,000 "
Namli	24th " »	M° 0 "
Sad&n	25th " 11	^
Halt	26th 11 »	^
Noi-chong	27th " "	1,000 ^
on Nawgo Kha	28th " , »	2,000 *
Phale*	29th " .1	500 "
'Nsentaru	30th " »>	—
Halt	31st , i))	—
"alt	»* Apfil -	Joo n
Patzam	2nd » *>	2,000 if
Tungwa Tungsa	3rd f) n	0 " ?
on 'Nmai Kha	4th r n	800 "
Ni«g Ting	5th " "	800 "
Shigu Ferry	6th " M	—
Halt	7th f i)	00 "
Lammuk	8th " »»	2>—
Halt	9th it >	—
Halt	10th j, n	—
on Chipwi Kha	n th " »	—
Chingnat	12th n n	—
Khanchik	13th " »	—
Mathe	14th " »	*—
on Mao Khoi Kha	15th " »	ft.
Wadze bok	16th " "	3>0<?J
on Uyan Kha	17th " "	"" p 7
Kyengmo Kha Ferry	18th " "	1,000 " (&
Camp	19th " "	" "
Camp	20th >f 9	2,200 n
Lachin	21st " "	2,700 >>
Chino	22nd M "	3,200 »
Chesyan	23rd " "	3,000 " ' ^
Halt	24th " "	— -- ^

Name of camp.	Date	Month	Height (above sea-level.)
Halt	25th	April 1897	—
Kabap	26th	» »	2,800 <i>ti</i>
Kepio *	27th	<i>ti</i> <i>if</i>	2,900 <i>ff</i>
Mi-ok	28th	<i>tt</i> <i>ff</i>	3,800 <i>ii</i>
Nong-wo	29th	<i>i</i> <i>I*</i>	3>900 <i>))</i>
Mangkyi	30th	<i>u</i> <i>ff</i>	—
"ong Kow	1st	May <i>i</i>	5,100 <i>it</i>
gmo	2nd	<i>if</i> <i>ff</i>	4,570 <i>it</i>
am	3 rd	<i>gi</i> <i>ti</i>	4,100 <i>ii</i>
Halt "	4th	<i>v</i> <i>it</i>	—
Halt "	5th	<i>ti</i> <i>it</i>	—
*k-kaoi	6th	<i>ii</i> <i>ff</i>	2,970 <i>if</i>

[Here the party left the mules behind.]

Choun [^] [^] [^] [^]	7th	May 1897	3,750 <i>ff</i>
Padè	8th	„ „	3,750 „
Pashè	9 th	11 >>	3>3 ⁰⁰ <i>ji</i>
Woghrup (lower village)	10th	„ „	3,650 „

From 7th May till 7th June no specimens could be collected.]

Pon ^{hr} ^{hr} ^{hr} ^{hr} (upper village)	11th	May 1897	4,350 „
Chi-rad ^g	12th	„ „ „	3,550 „
Hki ^g ^g ^g ^g	13th	„ „	3,700 „ ?
Tawlon*	14th	„ „	3,100 „ ?
Halt, *	15th	„ „	—
Halt "	16th	„ „	—
Ngaw-yü*	17th	„ „	—
Chong-teng	18th	May 1897	—
	19th	„ <i>ii</i>	*.

[Here the return journey was commenced.]

Ngaw-yü	20th	May 1897	—
Tawlon ⁵	21st	„ »	3,100 <i>n</i>
Halt "	22nd	<i>if</i> „	—

C Here the party was attacked at 3-30 A. M.]

Cenak	23rd	May 1897	—
Maghre	24th	<i>i*</i> <i>i</i>	TM*
Camp	25th	<i>ii</i> „	—
Camp	26th	<i>n</i> „	—
Camp	27th	„ <i>n</i>	—

Name of camp.	Date.	Height above sea-level.
Camp	28th May 1397	^
Camp	29th " v	—
Khet-o-byi	3 ^{ct} h " "	—
O-pa-tu	3 ^{1pt} I* »	—
Galeng	1st June if	—
Camp	2nd a »	—
Pe-lāp	3rd »f tt	—
Maru village	4th t> it	—
Mo-wok	5th tt n	—

[Here the party rejoined the mules J

Halt	6th June 1897	11,000 ft#
Neo-chawng	7th »»	7,000 ft#
Camp	8th 19 "	2,500 it
Pāla	gtb it "	1,500 " i
Matè	10th II "	1,500 v
Chipwi Kha	nth If "»»	1,000 it
Myaungjong	12th »»	QOv 'it
Camp	13th " "n	QOw it
on Tummao Kha	14th " »	00 "

[From this point onwards to Myitkyina the mules took 1 1/2 days; as the native collector accompanied the mules, Lieutenant Potter is unable to give precise localities for the specimens collected by the collector during this period : these specimens constitute the lot of those marked Myitkyina (E) in the systematic list, as obtained by the Calcutta Garden native collector working under Lieutenant Cruddas.]

Name of camp.	Date.	Height* above sea-level.
Mokong	15th June 1897	— 00 "
Hankow	16th " i>	^ " "
Kakhying	17th " ,1	x, 0 o " "
Myitkyina	18th " ;,	4 ^ o " "

§ 3.—LIST OF THE PLANTS OBSERVED OR COLLECTED IN THE HILLS DURING 1897.

[Z>, PRATN and E, POTTINGBR.]

In this list the identifications and distribution of the species communicated during 1897, whether by the expedition under Lieutenant Pottinger between March and June, or by the Garden collector working under Lieutenant Cruddas between June and December, are

Given in detail. The identifications have been made by Dr. Prain, except in the case of the orchids; for identifying the majority of these and for checking the identifications of the remainder, we are under great obligations to Mr. R. Pantling and to Sir George King. The field notes, localities and elevations are supplied by Lieutenant Pottinger, who is also responsible for those notes regarding species seen but not collected that are given within square brackets; some of these bracketed identifications, we would desire it to be understood, are tentative only, and in no case is any species thus mentioned provided with a serial number in the list or employed in discussing the probable affinities of the flora. The precise localities of the orchids, *Ucoecaris* specimens are not given; all are from within the Myitkyina district, though not necessarily from the immediate vicinity of the head-quarters of that district.

PHANEROGAMIA.

DICOTYLEDONES.

Tkalamiflora.

I.-RANUNCULACEAE.

1. *Thalictrum foliosum* DC.
Myitkyina (C), DISTRIBUTION: Temperate Himalaya; Khasia and Naga Hills.

* *Anemone rivularis* Ham.
Naga Hills; Myitkyina (E). DISTRIBUTION: Temperate Himalaya; Khasia and Naga Hills; mountains of S. India and Ceylon. A very distinct variety occurs on the Shan Plateau; the Kachin Hill plant is typical.

3. *Clematis acuminata* DC.
Myitkyina (C), DISTRIBUTION: Himalaya; Assam Ranges; Pegu. [A] *Clematis*, of which no specimens could be brought, was common on the mountain ranges between the upper waters of the Salween and the Na-chawng Kha.)

II.—DILLENIACEAE.

* *Piñenia pulcherrima* Kurz,
Myitkyina; a common scrubby tree (E); (C). DISTRIBUTION: Pegu and Shan Plateau.

III.-ANONACEAE.

5. *Unona dumosa* Roxb.

Myitkyina (C). DISTRIB. Sylhet and Assam ; also the Malay Peninsula ; our specimens are the first recorded from Burma.

6. *Goniothalamus peduncularis* King & Prain.

Myitkyina (C). A very distinct species, nearer to *G. Gardneri* and *G. Thwaitesii*, which are both Ceylon plants, than it is to any of the Indian species.

7. *Milusa macrocarpa* H. & T.

Bansparao, 2,000 ft. (E). DISTRIB Eastern Himalaya; Knas Hills; never before reported from Burma,

IV.—MENISPERMACEÆ.

8. *Paraboena sagittata* Miers.

Namlao (E). DISTRIB. Eastern Himalaya; Khasia; Chittago Andamans ; Pegu; South-West Yunnan (*Anderson*)

9. *Pericampylus incanus* Miers*

Namli, 2,000 ft. (E); Kakhying, 1000 feet (E). DISTRIB Himalaya; Southern China; Indo-China; Malaya.

10. *Cyclea* ? sp.

Namli, 2,000 ft. (E). DISTRIB. Taping Valley.

A very distinct plant, previously collected in the of South-West Yunnan by Dr. J. Anderson, F.R.S. Anderson's specimens nor ours have flowers or fruits, so cannot be given to the species. In the Calcutta Herbarium Mr. Kurz and Dr. King have referred the plant tentatively to and there is hardly room for doubt that it is an undescribed of that genus. The subjoined description will show how it is from any of the species hitherto published.

Leaves thinly membranous, peltate, ovate-rotund, entire, beset on both surfaces with long adpressed hairs, and but spreading, hairs fringing the leaf margins and clothing slender, somewhat wiry stems.

PAPAVERACEÆ.

Papaver somniferum Linn.—Usually Kachin gardens a few plants of the opium Poppy. The collection and smoking the drug have been described in the introductory chapter. The opium is used as a food-accessory and not as a narcotic; theless there are among the Kachins some who do not smoke and who pride themselves on being non-smokers, just as certain Europeans make a boast of not using tobacco. No stigma attaches to the opium-smoker, and those Kachins who do not themselves u

the drug grow the plant and prepare the opium in order to employ it as a medium of exchange.]

V.—CRUCIFER/E.

11. *Brassica juncea* H.f. & T. VAR. *agrestis* (*Sinapis patem* Roxb.)

Myitkyina, a weed (C). DISTRIB. Bengal, Assam, S. China.

[One of the usual garden-plants among the Kachins is a mustard grown for the sake of its edible leaves. No specimens were brought, but from Lieutenant Pottinger's description, it seems to be *Brassica rugosa* (*Sinapis rugosa* Roxb). In the NachawngKha Valley the seeds of this plant are ground and mixed with the meal either of maize or millet and baked into an unleavened cake of a highly thirst-provoking and indigestible character.]

VI.—CAPPARIDEJE.

12. *Gynandropsis heptaphylla* DC.

Myitkyina (C). DISTRIB. All warm countries.

13. *Capparis sabiaefolia* H.f. & T.

Phalao 1,300 to 2,100 feet (E). DISTRIB. Khasia and Naga Hills; also Chin Hills.

M. *Capparis tenera* Dale.

Namlao (E). DISTRIB. Assam, Arracan and Andamans, also South India; with distinct varieties in Ceylon and in Tenaaserim, respectively,

15. *Roydsia parviflora* Griff.

Namlao to Bansparao, 500 to 2,000 feet (E); Noichang to Phalao, 300 to 200 feet (E); Myitkyina (C). DISTRIB. Hukung Valley.

This very distinct species is now reported for the first time since its original discovery by Dr. Griffith, during his Assam-Ava journey.

The Peak plant referred to this species in Dr. King's *Materials for a Flora of the Malayan Peninsula*, is quite distinct from the Namlao and Hukung Valley one.

16. *Crataeva lophosperma* Kurz.

Myitkyina (C). DISTRIB. Assam.

VIOLARIEE.

[*Viola* spp.—Several different violets were met with while crossing the ranges between the head-waters of the La-khing Kha and Nachawng Kha, during the time that no specimens could be collected.]

VII.—POLYGALACEAE.

17. *Salomonina cantoniensis* Lour.

Myitkyina (C). DISTRIB. Eastern Bengal; Sikkim; Assam; Burma, China; Malaya.

13. *Polygala arillata* Ham.

Myitkyina (C). DISTRIB. Southern India; Himalaya; Indo-China; China; Malaya. There are two distinct forms reported, one with the simple racemes, the other with smaller firmer leaves and with flowers in terminal thyrsoid panicles.

19. *Polygala leptalea* DC.

Myitkyina (C). DISTRIB. India from Himalayas to Indo-China; Nicobars; Australia. Not from Malaya or China so far.

20. *Securidaca tavoyana* Wall.

Myitkyina (C). DISTRIB. Assam; Burma; Malaya and China.

21. *Xanthophyllum glaucum* Wall.

Myitkyina (C). DISTRIB. Chittagong; Burma; Malaya; before collected so far north.

VIII.—CARYOPHYLLACEAE.

22. *Stellaria media* Linn.

Myitkyina, a weed (E). DISTRIB. A cosmopolitan weed.

IX.—HYPERICINEAE,

23. *Hypericum patulum* Thunbg.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; also previously collected in the Taping Valley by Anderson.

X.—GUTTIFERAE.

24. *Garcinia lanceaefolia* Roxb.

Myitkyina (C) DISTRIB. Assam and Silhet; not before reported from Burma.

XI.—TERNSTROMIACEAE.

25. *Saurauja macrotricha* Kursem

Myaingjong, 800 feet (E). DISTRIB. Khasia {Clarke} previously collected by Dr. J. Anderson in the Taping Valley and by Df. Griffith in the Hukung Valley,

26. *Saurauja Roxburghii* Wall.

Lammuk (E); Myitkyina (C). DISTRIB; Sikkim; Assam; Pegu.

¹⁷« *Camellia Thea Link.*

Occasionally found wild throughout the route, as at Shigu Ferry, etc. also two cultivated plants found in a Kachin garden at Lammuk, ²>500 feet (E). DISTRIB. Assam Ranges; Southern China.

²%* *Anneslea fragrans Wall.*

Myitkyina (C). DISTRIB. Manipur; Shan Hills; Tenasserim.

*9- ^ *Eurya acuminata DC.* V AR. *euprista Korth.*

M Myitkyina(C). DISTRIB, Himalaya; Assam Ranges; Indo-China; Malaya.

XII-DIPTEROCARPE ^.

3°- *Shorea siamensis Miq.*

Wamlao (E), DISTRIB : Pegu; Siam; not before collected so far north,

XIII—MALVACEAE.

31. *Kydia calycina Roxb.*

B Myitkyina (C). DISTRIB. India; Himalaya; Assam and Burma.

3^ . *Abutilon indicum G. Don.*

Myitkyina (E). DISTRIB. A cosmopolitan tropical weed.

33. *Urena lobata Linn.*

Myitkyina (E). DISTRIB. A cosmopolitan tropical weed.

34. *Hibiscus cancellatus Roxb.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Burma.

35 *Hibiscus macrophyllus Roxb.*

Tenasserim (E) • DISTRIB. Assam; Chittagong; and East Bengal; Pegu and Malaya; not previously found so far north.

^ . *Thespesia Umpas Dak. & Gibs.*

Myitkyina (C). DISTRIB. India from Himalaya southwards; Indo-Malayan Islands; East Tropical Africa.

37. *Bombax roalabaricum DC.*

Myitkyina (Q; Phal6, 1,300 to 3,300 feet (E). DISTRIB. India; Malaya; N. Australia.

Species of *Gossypium* is generally cultivated by the Kachins; of which were brought. On the Chinese frontier two species were seen with large yellow, the other with red flowers, were but specimens could not be preserved.]

XIV.—STERCULIACEAE.

3^g • *sterculia coccinea Roxb.*

Myitkyina (E); banks of Tummao Kha, 70^o feet (E); Nawgo Kha, 1,300 to 200 feet (E). DISTRIB. Himalaya; Assam Ranges; Indo-China.

39. *Sterculia cognata* Prain.

Myitkyina (C).

This is a very distinct species, perhaps nearest *S. Roxb.* and its allies, but easily distinguished by its larger flowers and sessile, narrow leaves,

40. *Sterculia colorata* Roxb.

Bansparao, 2,000 feet (E). DISTRIB. Throughout India and Indo-China.

41. *Helicteres glabriuscula* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam and Burma.

42. *Helicteres Isora* Linn.

Myitkyina (C). DISTRIB. India and Malaya, not before reported from Burma and not sent from Assam.

43. *Buettneria pilosa* Roxb.

Namlao to Bansparao, 500 feet to 2,000 feet (E); Myitkyina (E). DISTRIB. Assam; Chittagong and Burma.

XV.—TILIACEJE.

44. *Grewia elastica* Royle,

Myitkyina (C). DISTRIB. Himalaya; Cachar and Burma. Introduced by Masters in *Flora of British India* to *G. astatica* a variety (VAR. *vestita*), but better kept separate.

45. *Grewia hirsuta* Vahi.

Myitkyina (E); (C). DISTRIB. Throughout India, not before sent from the Eastern Peninsula, but nevertheless exactly like the Indian plant,

46. *Grewia sapida* Roxb.

Myitkyina (C). DISTRIB. Himalaya and Assam, not before sent from Burma.

47. *Triumfetta pilosa* Roth,

Myitkyina (C). DISTRIB. India; Indo-China; China; Malaya; Africa.

48. *Elaeocarpus Braceanus* Watt,

Myitkyina (C). DISTRIB. Manipur, {Watt, Clarke).

Dtsciflora.

XVI.—LINEIE.

49. *Reinwardtia trigyna* Planch.

Myitkyina (C). DISTRIB. India; Indochina; China; Malaya.

XVII.—MALPIGHIACEJE.

50. *Hiptage candicans* Hf. & T.

Namlao (E). DISTRIB. Manipur; Burma.

XVIII.—GERANIACE/E.

51. *Impatiens bella* Hf. & T.

Myitkyina (Q. DISTRIB. Khasia and Naga Hills, not before re-
corded from Burma.

52. *Impatiens latiflora* Roxb. ?

Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges
This is a very common typical plant, and may prove specifically
distinct in the material is insufficient for absolute determination. If
new, its identity is most marked with the species mentioned. Exactly
the same plant has been collected by Dr. J. Anderson in the Taping
alley.

53. *Impatiens leptoceras* DC.

Myitkyina (C)- DISTRIB. Himalaya and Assam Ranges ; not
before sent from Burma.

54. *Impatiens puberula* DC.

Myitkyina (C)- DISTRIB. Eastern Himalaya and Assam Ranges |
not before sent from Burma,

Other Balsams were seen during the journey across
the mountain ranges at the head-waters of the Lakhing Kha and
of the Nachawng Kha.]

XIX.—RUTACE/E.

55. *Myrica senegalensis* Burtt.

Myitkyina (C), DISTRIB. Eastern Himalaya; Indo-China; Malaya.

56. *Micromelum pubescens* DC.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Indo-China ; Malaya;

57. *Zanthoxylum acanthopodium* DC.

Myitkyina (C) DISTRIB. Eastern Himalaya and the Assam Ranges;

Reported from any other part of Burma.

58. *Zanthoxylum ovalifolium* Wight.

Myitkyina (C)- DISTRIB. India; Eastern Himalaya and the Assam

Ranges. Not previously reported from Burma.

59. *Toddalia aculeata* Pert.

Myitkyina (C). DISTRIB. India ; Indo-China; China ; Malaya.

60. *Acronychia laurifolia* DC.

Myitkyina (C). DISTRIB. India ; Indo-China ; China; Malaya.

61. *Citrus Aurantiurn* Linn.

Myitkyina (E), cultivated. OISTRIB. Doubtfully with the

Eastern Himalaya.

62. *Citrus medica* Linn.

Myitkyina (C) ; Lammuk,wild (E). DiSTRiB. India ; Indo-

Eastern Himalaya.

XX.—SIMARUBEiE.

63. *Brucea mollis* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Rang^{es}

Karen Hills and mountains of Tenasserim.

XXI.—BURSERACEiE.

64. *Garuga pinnata* Roxb.

Ngaw-ytt, 5,000 Ceet (E). DiSTRiB. InJia; Indo-China ; M^m a^l a^y a^a.

65. *Protium serratum* Engl. (*Bursera serrata* Wall.) ^ As ^ j

Myitkyina (C). DISTRIB. South India; Central ? dia 5 tff, r, /**

Burma. The *Index Kewensis* accepts the name *Prottutn* s in India
Engler, as the correct designation for the tree better known
as *Bursera serrata*.

XXII.—MELIACEiE.

66. *Dysoxylum grande* Hiern ?

Myitkyina (C). DISTRIB. Assam ? The specimens are m^{tr} only
and cannot be definitely determined.

67. *Lansium decandrum* Harms. (*Amoora decanara* n^{aj, s} cent

Neo-chawng, 700 feet (E). DISTRIB. Eastern Himalaya Malayan
from the Assam Ranges. Said also to be present in f^{ch}
Peninsula, but this is doubtful,

68. *Cedrela Toona* Roxb.

Myitkyina (E). (C). DISTRIB. Himalaya India; »ⁿ /fo-China;
Malay Archipelago.

XXIII.—OLACINE^E.

69 *Olax acuminata* Wall.

Namlao to Bansparao, 500 to 2,000 feet, (E). DiSTRiB, Bhutan ;
Assam Ranges; previously obtained by Dr. J. Anderson in the Taping
Valley, but not elsewhere in Burma,

70. *Schoepfia f rag ran s* Wall.

Myitkiⁿia (f⁵)- DISTRIB. Eastern Himalaya and the Assam Ranges; not h^ol^tort collected in Burma.

71. *Cardiopteris lobata* R. Br.

Myitkiⁿia (C). DISTRIB. Indo-China from Silhet eastwards; Malaya. Piously obtained by Dr. J. Anderson in the Tapiug Valley.

ILICINEⁱE.

[An ile* with leaves like the European Holly (and therefore not iⁿ p^ro^vince dipyrena) was observed during the marches across the mount^ains between the upper reaches of the La-khing Kh^a and the Nachawng Kha.]

XXIV.—GELASTRINEJE.

72. *Celastrus paniculata* Willd.

Myitkiⁿia (C). DISTRIB. India; Indo-China and Malaya.

73. *Microtropis discolor* Wall.

Myitkiⁿia (C); DISTRIB. Himalaya ; Assam Ranges ; Tenasserim.

74. *Gymnosporia pallida* Coll. & Hemsl.

Vitkiⁿia (C). DISTRIB. Shan Plateau.

XXV.—RHAMNE^eE.

75. *Zwyphut rugosa* Lamh.

Myitkiⁿia (E). DISTRIB. India; Himalaya ; Indo-China.

76. *Zizyphus* ? ? sp.

Myitkiⁿia (C). DISTRIB. Taping Valley.

P. (A^vg^e 7 distinct plant, originally obtained by Dr. J. Anderson, examined in the Tapiug Valley, South-West Yunnan. Dr. Anderson's

Material is without flower or fruit, has been identified by Kurz with *Z. CEnopha*. Our specimens, which are in fruit only, show that the plant is certainly not *Z. CEnopha*; and almost certainly not a *Z. CEnopha*; and almost certainly if a *Zizyphus* it belongs to no species hitherto better to locate the plant where Mr. Kurz has tentatively placed it.

77. *Rhamnus nipaleisis* Walt.

Shan³Myitkiⁿia (C)- DISTRIB. Eastern Himalaya; Assam Ranges and Hills,

XXVI.—AMPELIDEⁱE.

78. *Vitisaugustifolia* Wall.

Phaul^u (ME). DISTRIB. Assam ; Silhet; Tenasserim; Sumatra,

79. *Vitis lanceolaria* Roxb.

- Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya.
 80. *Vitis oxyphylla* Wall. (*V. dubia* Laws.)
 Namlaio to Bansparao, 500 to 2,000 feet (E). DISTRIB. E. Hima-
 laya ; Assam and Chittagong ; not before sent from Burma.
 81. *Vitis repens* W. & A.
 Myitkyina (C). DISTRIB. Eastern Himalayas ; Indo-China ;
 Malaya. There are also specimens of a plant from Southern India
 the *Scutellaria* Herbas of which are doubtfully referable to the
 species.

XXVII.—SAPINDACEÆ.

82. *Allophylus* Colf DC. VAR. *glabra* Roxb. (sp.)
 Myitkyina (C). DISTRIB. India ; Indo-China ;
 Ceylon ; Malaya,
Pisanthes burmannica Kurz.
 Myitkyina (C). DISTRIB. Pegu and Tenasserim
 [*Nephelium litchi* b. Ute « *rt • « • obtained at a
 village in the hills east of Sentaru Ferry ; the quality
 was rather indifferent ; the fruit was not met with further north.]

XXXVIII.—SABIACEÆ.

84. *Meliosma simplicifolia* Roxb.
 Shigu Ferry, 800 feet, (E). DISTRIB. Southern India ; Himalaya ;
 Indo-China.

ANACARDIACEÆ.

- [*Mangifera indica* Linn.—The mango is cultivated sparingly
 the fruit is as far north as the confluence, but the fruit is of
 of very good quality.]

Calyciflorae.

XXIX.—CONNARACEÆ.

85. *Tæniocladia birmanica* Prain.
 Myitkyina (C).
 A very distinct species ; only a few specimens of the genus in
 Malayan.

XXX.—LEGUMINOSÆ.

86. *Crotalaria alata* Ham.
 Myitkyina (E). DISTRIB. India ; Indo-China ; Malaya.
 87. *Crotalaria ferruginea* Wall.

Nawgo Kha, 1,300 to 2,000ft. (E); Myitkyina (C). DISTRIB. Himalaya; Indo-China; Malaga; also Ceylon. Not reported from India.

The Nawgo Kha examples are typical; those from Myitkyina are much less hirsute and are not at all ferrugineously tomentose.

88. *Indigofera atropurpurea* Ham. VAR. *nigrescens*.

Myitkyina (C). DISTRIB. (of the variety) Khasia Hills; Taping Valley and Shan Plateau.

This is the form for which Mr. Kurz has proposed the name *Indigofera nigrescens*; it has much smaller flowers and thinner leaflets than the true plant and doubtless deserves the specific rank which Kurz claims for it.

89. *Millettia pachycarpa* Bth.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Tenasserim.

90. *Millettia puerarioides* Prain.

Myitkyina, 1,500 ft. (E); Myitkyina (C). DISTRIB. E. Indo-China.

91. *Millettia pulchra* Benth.

Myitkyina (E). DISTRIB. Assam Ranges; also previously collected by Anderson in the Taping Valley, but not reported from elsewhere in Burma.

92. *Wistaria chinensis* Sieb. & Zucc.

Namlao to Bansparao, 500 to 2,000ft. (E). DISTRIB. China. Introduced to Japan from China and thence to Europe. Even in China the localities where this is wild seem doubtful; Lieutenant Pottinger points out that there is no doubt about its being wild here. Not previously recorded from any Indian or Indo-Chinese locality.

93. *Desmodium cephalotes* DC.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

The specimens belong to typical *D. cephalotes*.

94. *Desmodium gangeticum* DC.

Myitkyina (E), DISTRIB. A weed everywhere in the tropics of the Eastern Hemisphere; introduced also in the West Indies.

95. *Desmodium gyroides* DC.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China; China; Malaya; also Ceylon, but not in India proper.

96. *Desmodium latifolium* DC.

Myitkyina (C). DISTRIB. A weed throughout the tropics of the Eastern Hemisphere; introduced in the West Indies.

97*. *Desmodium laxiflorum* DC.

Myitkyina (C). DISTRIB. General throughout South-Eastern Asia.

98*. *Desmodium oblongum* Wall.

Myitkyina (C). DISTRIB. Shan Plateau; Karen Hills.

99. *Desmodium oxyphyllum* DC.

Myitkyina (C). DiSTRIB. Eastern Himalaya; Assam Ranges, China and Japan.

This is *D. poiocarpum* Baker, in part, of the ^{Flora} *British India* (*D. japonicum*, Miq.) and not the *D. oxyphyllum* of the ^{Flora} *British India*.

100. *Desmodium parvifolium* DC. MaUy^{al>}

Myitkyina (C). DiSTRIB. India; Indo-China; Himalaya; Malay Archipelago; China and Japan.

101. *Desmodium polycarpum* DC. Eastern

Myitkyina (C). DiSTRIB. Throughout the tropics of the Hemisphere and Polynesia.

102. *Desmodium pseudo-triquetrum* DC. Ranges;

Myitkyina (C). DiSTRIB. Eastern Himalaya and Assam never before collected in Burma. This does not occur in proper or in Indo-China and has not been as yet collected in India.

103. *Desmodium pulchellum* Bth. n Asia.

Myitkyina (C). DiSTRIB. Throughout South-Eastern Asia. Collected both by Griffith in the Hukung Valley and by Ander-son in the Taping Valley.

104. *Desmodium Scalpe* DC. Islands;

Myitkyina (C). DiSTRIB. South India; Manipur; Malay Africa;

A curiously detached distribution, for the plant has not as yet been recorded from anywhere in Assam except Manipur, nor anywhere in Burma except the Kachin Hills, and does not occur in the Himalayas. It is common in Africa, in Peninsula and in the Malay Archipelago.

105. *Desmodium tiliaefolium* G. Don.

Myitkyina (C). DiSTRIB. Himalaya.

106. *Desmodium triquetrum* DC.

Namli, 2,000 to 2,500 ft. (E). DiSTRIB. India; Indo-China; Malaya. This has never been found in the Himalayan region.

107. *Uraria crinita* Desv. China; Namlao (E); Myitkyina (C). DiSTRIB. Tropics of the Eastern Hemisphere; though said by Baker to come both from the Himalaya and from India, there are no specimens from either region in the Herbarium at Calcutta.

108. *Uraria hamosa* Wall.

Myitkyina (C). DiSTRIB. India; Indo-China; Malaya.

109. *Uraria lagopoides* DC. Aust^{mf*}

Myitkyina (C). DiSTRIB. Assam; Burma; Malaya; China; India. This occurs also in Lower Bengal, but not elsewhere in India.

no, *Urana picta* *Dcsm*.

Myitkyina (C). DISTRIB. Tropics of the Eastern Hemisphere.

¹¹11. *Lespedeza parviflora* *Kurz*,

Myitkyina (C). DISTRIB. Shan Plateau, Karen Hills.

¹²12. *Abrus pulchellus* *Wall*

Myitkyina (C). DISTRIB. Himalaya, Indo-China, Malaya, also Ceylon, but not in India proper.

¹³13. *Shuteria vestita* *W. & A.*

Myitkyina (C). DISTRIB. India; Himalaya; Indo-China; Malaya.

H4. *Erythrina stricta* *Roxb.*

Namli, 2,000 ft. (E). DISTRIB. India from Rajputana to Orissa; Assam; Burma and Chittagong; not in the Himalayas.

^{15*}15* *Mucuna macrocarpa* *Wall.*

Namli, 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Shan Hills.

A creeper with stems as thick as a man's thigh, flowers on old wood [*Pottinger*]. Previously collected by Dr. Anderson at Poneshee in the Taping Valley.

H6. *Spatholobus Pottingeri* *Prain.*

Namli, 2,000 to 2,500 ft. (E).

A very fine species nearest to the Malayan *S. ferrugineus* and *gyrocarpus*.

¹⁷17. *Cruddasia insignis* *Prain.*

Myitkyina (C)

A very distinct plant with most of the characters of a *Pueraria*, except that its leaves are 5-foliolate, and that it has a penicillate stigma.

¹⁸18. *Pueraria bella* *Prain.*

Myitkyina (C).

A very distinct species, apparently nearest *P. Thunbergiana*.

¹⁹19. *Pueraria Candollei* *Grak.*

Namlao (E). DISTRIB. Chittagong; Pegu and Tenasserim.

²⁰20. *Pueraria phaseoloides* *Bth.* VAR. *javanica* *Bak.*

Myitkyina (C). DISTRIB. (of the variety), India and Malaya; Assam; not before recorded from Burma.

²¹21. *Pueraria subspicata* *Bth.*

Myitkyina (C). DISTRIB. Eastern Himalaya and Indo-China from Assam eastwards.

²²22. *Pueraria Thunbergiana* *Bth.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; China and Japan.

²³23. *Canavalia ensiformis* *DC.* VAR. *virosa* *Bak.*

Myitkyina (C). DISTRIB. India, China and Malaya.
124. *Phaseolus calcaratus* Roxb.

DISTRIB. India; Himalaya; Indo-China; Malaya.
3ak.

Myitkyina (E). DISTRIB. India; Himalaya; Indo-China.
126. *Dolichos Lablab* Linn.

Myitkyina (E). DISTRIB. Throughout * topics of the OU
World.

Cultivated throughout the Kachin Hills.

127. *Dunbaria fusca* kurz.

Myitkyina (C). DISTRIB. Prome.

A very interesting re-discovery of one of Wallich's Burmese
species,

128. *Phaseolus congestus* Roxb.

Phalé, 1,300 to 3,300 ft. (E). DISTRIB. India; Himalaya; China;
Indo-China; Malaya.

The species described and figured by Roxburgh.

129. Jleming

Myitkyina (E); (C) Malaya. DISTRIB. India; Himalaya;
Assam Ranges.

This is not previously connected east of the Assam ranges
of Muntala.

130. *Dalbergia Kingiana* Prain.
Myitkyina (C).

species, nearest to, but very distinct from, *Dalbergia*
na Prain. (*D. rubiginosa* Benth. in *Flora of Hongkong*,
Roxburgh in *Flora Indica*, or of Baker in *Flora of British*

131. *Dalbergia rimosa* Roxb.

Myitkyina (C). DISTRIB. Eastern Himalaya and throughout
Assam Range but previously collected in Burma.

132. *Dalbergia stipulacea* Roxb.

Myitkyina (C). DISTRIB. Eastern Himalaya, Assam Ranges, and
Upper Burma.

133. *Derris latifolia* Prain.

Myitkyina (C).

A very distinct species, nearest *D. Wallichxi*

134. *Mezoneuron cucullatum* W & A.

DISTRIB. India; Himalaya; Assam; Burma.

Neochawng, 2,500 ft. (E). DISTRIB. India; Indo-China; Malaya.

136. *Cassia nodosa* Hum.

^m Myitkyina (E). DISTRIB. Assam Ranges; Indo-China; Malaya; said by Mr. Baker to occur in the Eastern Himalaya, but there ere no Samples at Calcutta from north of the Brahmaputra.

¹³⁷» *Bauhinia Pottingeri Prain.*

Namlao to Bansparao, 500 to 2,000 ft. (E).

A very fine species, belonging to the group that includes *B. ferruginea* and *B. nervosa*, but with rather larger flowers than any hitherto known member of its group.

¹³⁸& *Bauhinia variegata Linn.*

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. India r Himalaya; Indo-China ; China.

¹³⁹» *Calliandra umbrosa Btk.*

Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges ; ^{also} reported from the Chin Hills, but not from the country east of the Irrauaday Valley.

140. *Acacia pennata Willd.*

Bansparao, 2,000 ft. (E). DISTRIB. India; Indo-China; Malaya.

*4i. *Acacia pruinescens Kurs,*

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Upper Assam ; also previ- ously collected both by Dr. Griffith in the Hukung Valley and by Dr. Anderson at Poneshee in the Taping Valley.

*4». *Albizzia lucida Bth.*

Myitkyina (C). DISTRIB. Himalaya; Assam ; Burma ; Tenas- serim.

•43^ *Pithecolobium angulatum Bth%*

.. Myitkyina (C), DISTRIB. Eastern Himalaya; Indo-China and Malaya.

¹⁴⁴. *Pithecolobium bigeminum Mart.*

^{a d} Pala, ^{1>500 ft *E}); M^yitk^yina (C)- DISTRIB. W. India; E. Himalaya ^{n - Ass}am ; not before collected in Burma,

^{j m} [Peas were found cultivated in the villages on the Chinese ^rontier, and other beans besides the *Sim (Dolichos Lablab)* were ⁿoticed [#] in gardens during the journey.]

XXXI.—ROSACES.

¹⁴⁵. *Prunus acuminata Wall.*

^{Myitkyina} (C). DISTRIB, Himalaya; Assam; not before sent from ^{Burma,}

^{se e} *Prunus Armenaiaca Linn.*—The Apricot was very often during the journey; no specimens were brought. The ^{A pr, Cot} occurs also among Dr. Anderson's specimens from Momien ^{the} Taping Valley,]

146. *Prunus persica* Linn.

Shigu Ferry, 2,500 ft.; cultivated (E). Grown in the cooler parts of India,

The Peach was seen in other places also, but was not so common as the Apricot. This likewise occurs, among Dr. Anderson's specimens from Momien and elsewhere in Taping Valley.

147. *Prunus Puddum* Roxb.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China;

148. *Neillia thyrsiflora* Don.

Myitkyina (C). DISTRIB. Eastern Himalaya; Khasia; Manipur; also Java; not before collected in Burma.

149. *Rubus hexagynus* Roxb.

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Shan Plateau; also previously collected in the Valley-

[Various other species of *Rubus*, among them, were common.] Lieutenant Pottinger's notes, *R. moluccanus* and *R. rostratus* were common.]

[*Fragaria indica* Linn.—This was very frequently met during the journey, but no specimen was collected.]

[*Fragaria elatior* Ehrh.—This was plentiful in the high ranges between the head-waters of the Lakhing Kha and the Nac Kha, but no examples could be brought.]

150. *Potentilla Kleiniana* Wight.

Phal«, 1,300 to 3,300 ft. (E). DISTRIB. India; Indo-China; China; previously collected by Dr. Anderson at Ponesnee Taping Valley.

151. *Agrimonia Eupatorium* Linn.

Myitkyina (C). DISTRIB. Himalaya; Indo-China; China; Asia; Japan; doubtfully reported from Java,

152. *Rosa involucrata* Roxb.

Myitkyina (E) DISTRIB. India; Assam; Burma.

[*Docynia indica* Dene.—This was very common throughout the Kachin Hills.]

153. *Photinia Notoniana* W. & A., VAR. *macrophylla*

Myitkyina (C). DISTRIB. (of the variety), Khasia before sent from Burma.

XXXII—SAXIFRAGACEAE.

154. *Hydrangea robusta* H.f. & T., VAR. *Griffithii* Clarke.

Myitkyina (C). DiSTRiB. East Himalaya. This would be better considered a distinct species.

¹SS> *Hydrangea Pottingeri Prain*.

Lakham, 4,100 ft. (£).

A very distinct species.

156. *Dichroa febrifuga Lour.*

Myitkyina (C). DiSTRiB. Himalaya j Assam; Malaya ; China; hdo-China.

157. *Escalloniarum* genus novum.

Chesyan, 3,000 ft. (E.)

A plant that forms the type of a very distinct new genus near to ^{the} ^{*} [%] The solitary example is in fruit, and as the petals have fallen ^a and the anthers have dropped, the publication of a diagnosis is for ^{he} the moment deferred,

158. *Itea macrophylla Wall.*

^a Pala, 1500 ft. (E) ; Myaungjong 600 ft. (E). DiSTRiB. Hima. ^{ia}ya ; Assam Ranges; Malaya ; not before collected in Burma.

XXXIIL—HAMAMELIDEJE.

¹59. *Altingia excelsa Nor on ha.*

Myitkyina (B). DiSTRiB. Eastern Himalaja; Yunnan; Indo-^{China} ; Malaya.

XXXIV.-COMBRETACE/E.

¹60. *Terminalia argyrophylla King G? Prain.*

Myitkyina (C).

A very striking new species, noted as being a " timber-tree [>] ^f ^by the Garden collector.

^{*}61. *Terminalia Chebula Rets.*

[%]itkyioa (C). DiSTRiB. India, Indo-China, Malaya.

³62. *Terminalia myriocarpa Henk. \$ Muell*

Myitkyina (C). DiSTRiB. Himalaya ; Assam; Upper Burma,

¹63- *Calycopteris floribunda Wall.*

^C^h^J Namlao to Bansparao, 500 to 2,000 ft. (E). DiSTRiB. India, Indo-^{na}, Malaya, not in the Himalayan Ranges.

XXXV.—MYRTACEJE.

[^]64. *Eugenia claviflora Roxb.*

[']Nsentaru, 600 ft. (E). DiSTRiB. Malaya and Indo-China ; not Previously found so far north.

[^]5. *Eugenia Griffithii DuthU.*

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Khasia Hills plentiful. Founded on Griffith, 2,375, which is said* to have come from Malacca but may be from the Hukung Valley, Griffith's Burmese and Malayan specimens having become somewhat confused.

166. *Eugenia obvata* Wall.
Myitkyina (C). DISTRIB. Himalaya; Assam; Indo-China. M,
Duthie considers this only a distinct variety of *E. operculata* Roxb.

XXXVI.—MELASTOMACEÆ.

167. *Osbeckia chinensis* Linn.
Myitkyina (C). DISTRIB. India; Indo-China; Malaya; China and Japan; Australia.

168. *Melastoma malabathricum* Linn.
Nawgo Kha, 1,300 to 2,000 ft. (E); Myitkyina (C). DISTRIB. India; Himalaya; Assam. The true plant; not before found in Burma.

169. *Melastoma normale* Don.
Myitkyina (C). DISTRIB. Himalaya; Assam; Indo-China.

170. *Oxyspora paniculata* DC.
Myitkyina (C). DISTRIB. Himalaya; Assam Ranges.

171. *Sonerila maculata* Roxb.
Myitkyina (C). DISTRIB. Himalaya; Indo-China.

XXXVII.—LYTHRARIÆ.

172. *Woodfordia floribunda* Salisb.
Myitkyina (C). DISTRIB. India; Indo-China; China; Africa.

173. *Lagerstroemia parviflora* Roxb., VAR *bengalensis* Clarke.
Myitkyina (C). DISTRIB. (of the variety, Eastera Hiroa, a Griffith's, the Hukung Valley, Assam; also previously obtained by Dr. Griffith, but not elsewhere in Burma.

174. *Punica Granatum* Linn.
%kVLT cultivated (E). DISTRIB. Cultivated in most warm entries. Wild from North-Western India to Persia.

XXXVIII.—SAMYDACEÆ.

175. *Casearia graveolens* Dals.
Myitkyina (C). DISTRIB. India; Himalaya; Assam; Burma.

XXXIX.—CUCURBITACEÆ.

176. *Hodgsonia heteroclita* H. f. & T.

Nawgo Kha, 1,300 to 2,000ft. (E). DISTRIB. Eastern Himalaya; Assam ; Indo-China; Malaya.

'71* *Trichosanthes palmata Roxb.*

%itkyina (C). DISTRIB. India ; Indo China; Malaya; previously Elected by Dr. Anderson at Mynela in the Taping Valley.

'78. *Trichosanthes Wallichiana Wight.*

Myitkyina (C). DISTRIB. India; Himalaya ; Assam ; China; Burma, Malaya. This is the *T. multiloba* of the *Flora of British India*, but not the true *T. multiloba* Miq.

'79- *Gymnopetalum cochinchinense Rurz.*

Myitkyina (C). DISTRIB. East Himalaya; Assam; Burma; Malaya, Chin-China; China. Mr. Clarke also records it from Chota Nagpur. J80, *Thladiantha Hookeri C. A Clarke.*

Myitkyina (C). DISTRIB. Cachar, Khasia and Naga Hills ; not Def ore sent from Burma.

'81. *Alsomitra pubigera Pr&in.*

Myitkyina (C). A very distinct species, with velvety petioles and fruits.

XL.—BEGONIACEJE.

J8a. *Begonia barbata Wall*

Myitkyina (E). DISTRIB. Eastern Himalaya and the Assam Ses; Burma.

^3 *Begonia gigantea Wall.*

Myitkyina (E). DISTRIB. Eastern Himalaya and the Assam Ranges, common : not before sent from Burma.

[Several other species of *Begonia* were seen but specimens could not be brought.]

XLL—UMBELLIFER^E.

184. *Hydrocotyle javanica Thunbg.*

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia and in East Africa!

185. *Htiracleum Wallichii DC.*

%itkyina (C). DISTRIB. Central and Eastern Himalaya.

XLII.—ARALIACE^E.

j*6. *Aralia armata Seem.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam; Kedah; and Assam. Not before collected so far north.

188. *Heptapleuruna Lawranceanum Prain.*

Agalma. am » 4)100 ft. (E). A very distinct species of the section

XLIII.—CORNACEAE.

188. *Marlea begoniaefolia Roxb.*
 Myitkyina (C). DiSTRIB. Northern India; Assam and Burma;
 China; and Japan.
189. *Mastixia euonymoides Prain.*
 Myitkyina (C), A very fine and distinct new species.
190. *Alangium Kingianum Prain.* 1 f d to
 Myitkyina (C). A very distinct species, most nearly related
 A. *Faberi Oliv.*

Corolliflorz.

XLIV.—CAPRIFOLIACEJE.

191. *Sambucus javanica DC,*
 Myitkyina (C). DiSTRIB. Assam; Indo-China; China;
 Previously sent from the Taping Valley by Anderson,
192. *Viburnum coriaceum DC.* Pre-
 Myitkyina (C). DiSTRIB. Himalaya; Indo-China; Malaya.
 viously sent from the Taping Valley by Anderson.
193. *Lonicera japonica Thunbg,*
 Myitkyina (C), DiSTRIB. China; Japan; also Assam (Naga
Dr. Watt.)

XLV.—RUBIACEJE.

194. *Adina sessilifolia Hook. fit.*
 Myitkyina (C). DiSTRIB. Cachar; Chittagong; Prome.
195. *Uncaria macrophylla Wall.*
 Myitkyina (C). DiSTRIB. Eastern Himalaya and Assam.
196. *Uncaria sessilifructus Roxb,*
 Myitkyina (C). DiSTRIB. Eastern Himalaya; Assam and Indo-China.
197. *Luculia gratissima Wall.*
 Myitkyina (C). DiSTRIB. Himalaya; Burma.
198. *Wendlandia paniculata DC.*
 Namlaoto Bansparao, 500 to 1,000 ft. (E). DiSTRIB. Assam;
 Burma; Malay; China.
199. *Wendlandia tinctoria DC.*
 Myitkyina (E). DiSTRIB. Northern India and Himalaya; Assam,
 Burma; doubtfully in Java.
200. *Hedyotis capitallata Wall.*
 Myitkyina (C). DiSTRIB. Manipur; Shan Hills; Tenasserim;
 Malaya; also previously collected in the Taping Valley but not
 elsewhere in Yunnan.

- 201, *Hedyotis hispida* Retz,
Myitkyina (C). DiSTRIB. India ; [ndo-China ; China; Malaya.
- 202, *Hedyotis scandens* Roxb,
Myitkyina (C). DiSTRIB. Himalaya; Assam; Chittagong. Already
collected by Anderson in the Taping Valley, but not before in Upper
Burma.
- 203, *Anotis ingrata* Hook. fil
Myitkyina (C). DiSTRIB. Himalaya and the Assam Ranges ; not
before collected in Burma.
204. *Spiradiclis cylindrica* Hook, fil
Myitkyina (C). DiSTRIB. Assam Ranges; not before collected in
Burma.
205. *Ophiorrhiza Harrissiana* Heyne, VAR. *argentea* Hk J,
Ningting, 3,000 ft. (E); Myitkyina (C). DiSTRIB. (of the variety),
In⁽ta; Assam; not before obtained in Burma.
206. *Ophiorrhiza hispida* Hook, fil.
Namlao to Bansparao, 500 to 2,000 ft. (E). DiSTRIB. Khasia Hills;
^char; Makum Forest; not before obtained in Burma.
- ²⁰7. *Ophiorrhiza Kingiana* Prain.
Myitkyina (C).
A distinct species, nearest *O. lurida* Hook. f.
- ²⁰8. *Carlemannia Griffithii* Benth.
Myitkyina (C). DiSTRIB. Eastern Himalaya and Assam Ranges;
not before collected in Burma.
- ²⁰9. *Mussaenda macrophylla* W & A. — *Th* was plentiful in the lower
I no specimens were brought]
- ²⁰9. *Mussaenda Roxburghii* Hook. f.
Myitkyina (C), DiSTRIB. Himalaya; Assam Ranges; Burma.
Jio. *Mussaenda* sp.
Myitkyina (E).
- Of this very distinct plant only one specimen has been reported ;
!T < h insufficient for descriptive purposes, it suffices to show that
s^{tl}s very distinct from any of the Indian, Indo-Chinese, or Chinese
-Pec>>es represented in Herb. Calcutta. It most resembles *M.*
pavetta *flora* Kurz, and is evidently nearly allied thereto, but the
^Un § corollas are adpressed grey-silky, whereas in *M. pavetta* *flora*
ese are quite glabrous.
- ²¹1. *Randia Wallichii* Hook. f.
Myitkyina (C). DiSTRIB. Himalaya; Assam Ranges, - Indo-China;
Malay Archipelago ; also previously collected in the Taping Valley.
- ²¹2. *Gardenia erythroclada* Kurz,
Myitkyina (C). DiSTRIB. Pegu.

213. *Coffea Jenkinsii* Hook./*

Neochawng, 2,500 to 7,000 ft. (E); Myitkyina (C) DISTRIB. Assam Ranges; not before sent from Burma.

214. *Morinda augustifolia* Roxb.

Namlao to Bansparao, 500 to 2,000 ft. (E); Mate*, 1,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China.

215. *Psychotria adenophylla* Wall.

Banks of Tummao Kha, 700 ft. (E); Myitkyina (E). DISTRIB. Assam Ranges; Chittagong; Burma; Andamans.

216. *Psychotria calocarpa* Kurz.

Banks of Nmai Kha, 900 ft. (E); Namli, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China.

217. *Psychotria erratica* Hook./.

Neochawng, 2,500 ft. (E). DISTRIB. Eastern Himalaya and Assam Ranges; not before sent from Burma.

218. *Chasalia curviflora* Thw.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

219. *Lasianthus Wallichii* Wight.

Myitkyina (C). DISTRIB. Assam; Burma; Andamans; Ceylon; Malaya (a distinct variety).

220. *Paederia Cruddasiana* Prain.

Myitkyina (C),

A very distinct new species of the group with fruits compressed.

XLVI.—COMPOSITE.

221. *Vernonia arborea* Ham.

Myitkyina (E). DISTRIB. India; Assam; Indo-China; Malay*

222. *Vernonia cinerea* Less.

Myitkyina (E); (C). DISTRIB. Throughout the Tropics of Eastern Hemisphere.

223. *Vernonia scandens* DC.

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Burma.

224. *Vernonia volkameriaefolia* DC.

Myitkyina (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China.

225. *Adenostemma viscosum* Forst., VAR. *elata* Clarke*

Myitkyina (C). DISTRIB. Throughout the Tropics.

226. *Dichrocephala latifolia* DC.

Myitkyina (C). DISTRIB. Tropics of Old World.

227. *Blumea balsamifera* DC.

Myitkyina, 450 ft. (E). DiSTRiB. Eastern Himalaya ; China ; Indo-China ; Malaya.

228. *Blumea chinensis* DC.

Myitkyina (E). DiSTRiB. Eastern Himalaya ; China ; Indo China ; Malaya.

229. *Blumea myriocephala* DC.

Namlao (E). DiSTRiB. Eastern Himalaya ; Indo-China ; China.

³⁰« *Laggera flava* Benth.

Myitkyina (C). DiSTRiB. General in South-Eastern Asia, in the drier parts.

^{3L} *Gnaphalium indicum* Linn,

Myitkyina (E). DiSTRiB. Drier parts of Tropics of Old World.

232. *Vicoa auriculata* Cass.

Myitkyina (E). DiSTRiB. Drier regions of India and IndoChina.

233. *Cotula hemisphaerica* Wall.

Myitkyina (E). DiSTRiB. Rice-fields of Northern India, and of Assam, Burma and China.

234. *Spilanthes Acmelia* Linn., VAR. *calva* Clarke.

Myitkyina (C). DiSTRiB. Throughout the warmer parts of India and Indo-China.

³⁵» *Artemisia vulgaris* Linn.

Myitkyina and elsewhere, up to 5,000 ft. (E) ; (C), DiSTRiB. Temperate Parts of Europe and Asia.

236. *Senecio araneosus* DC.

Nawgo Kha, 1,300 to 2,000 ft. (E). DiSTRiB. India; Himalaya; Assam Ranges, not before collected in Burma.

³⁷ *Senecio yunnanensis* Waft. MSS. in *Herb. Calcutta*.

Myitkyina (C). DiSTRiB. « Upper Assam (Simons) and Taping Valley (J'Anderson). Both Mr. Clarke and Mr. Kurz have included *vegans*, which in externals it closely resembles.

³⁸ ; *Emilia prenanthoidea* DC.

Myitkyina (C). DiSTRiB. Eastern Himalaya; Assam Ranges. Usually collected by Anderson in the Taping Valley, but not elsewhere in Burma.

XLVII.—CAMPANULACEAE.

³⁹» *Pratia begonifolia* Lindl

Myitkyina (C). DiSTRiB. Eastern Himalaya; Assam Ranges; Indo-China ; Malaya.

240. *Lobelia affinis* Wall.

Namlao (E) Myitkyina (C)- DiSTRiB. Eastern Himalaya ; Assam Ranges ; China ; Indo-China ; Malaya.

241. *Lobelia rosea* Wall.

Myitkyina (C). DISTRIB. Himalaya ; Assam ; Burma.

242. *Wahlenbergia gracilis* DC.

Myitkyina (C). DISTRIB. Tropics of Old World.

243. *Campanumcea parviflora* Bth.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Rang^{es} ,
Plateau. Shan

XLVIII.—VACCINIACEAE.

244. *Agapetes Pottingeri* Prain.

Lakham, 4,100 ft. (E). section of

A very distinct species, forming the type of a new
Agapetes.

245. *Desmogyne nerii folia* King & Prain.

Myitkyina (C). DISTRIB. Chin Hills.

XLIX.—ERICACEAE.

246. *Pieris ovalifolia* Don.

Hankow, 500 ft. (E). DISTRIB. Himalaya; Assam Ranges ,
China; China; Japan. Indo.

247. *Rhododendron indicum* Linn.

Ningting, 800 ft. (E). DISTRIB. China and Japan ; also pr^{evjousiy}
collected by Dr. J. Anderson at Momien in the Taping Valley-
[Several *Rhododendrons* were met with while crossing the moun-
tains between the head-waters of the Lakhing Kha and the Nachawng
Kha.]

L.—PRIMULACEAE.

248. *Lysimachia evalvis* Wall., VAR. *grandifolia* Prain* ^

Neochawng, 2,500 ft. (E). This differs from the type .^{ver.?} JJ, cicut
siderably and may be a distinct species, but the material is insu^{edice}
for definite decision. *Leaves* 6in, long, 2'25in. wide; P
2 in. long.

249. *Lysimachia ramosa* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Raⁿ e9|.
Java. Previously collected by Dr. Griffith in the Hukung ya^{ley,}
but not elsewhere in Burma. A distinct variety occurs in Ceyl^{n.}

LI.—MYRSINEAE.

250. *Ardisia crenata* Sims.

Bansparao, 2,000 ft. (E). DISTRIB, China; Japan; Malay a.
also Pegu (/Curs.) »

251. *Ardisia virens* Kurx.

Myitkyina (C). DISTRIB. Assam Ranges; also previously collected by Dr. J. Anderson at Munwine, in the Taping Valley.

²⁵*. *Pimelandra Griffithii Clarke*.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Previously collected by Dr. Griffith during his Hukung Valley journey.

LII.—SAPOTACEAE.

²⁵³» *Sarcosperma arborcum Benth**

Myitkyina (Cj. DISTRIB. Himalaya ; Assam; Hukung [*Griffith*]; Pegu [*Brandts*].

[*Diospyros Kaki* Linn.—'Near Kumpi Bum, the *KSg* fruit was brought to Lieutenant Pottinger's party by the villagers; the tree was not seen.]

LIII.—STYRACEAE.

254. *Symplocos racemosa Roxb*.

Myitkyina (C). DISTRIB. Northern India; Indo-China; China.

LIV.—OLEACEAE.

²⁵⁵- *Jasminum anastomosans Wall*.

Myitkyina (C). Banks of the Nmai Kha. (E). DISTRIB. Eastern Himalaya ; Assam Ranges ; Burma.

²⁵⁶. *Jasminum decussatum Wall*.

Myitkyina (C). DISTRIB. Burma.

²⁵⁷« *Jasminum scandena Vahl*.

Namlao (E); Namlao to Bansparao, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo China.

LV.—APOCYNACEAE.

²⁵⁸. *Rauwolfia chinensis HemsU*

Pala, 1,500 ft. (E). DISTRIB. China.

²⁵⁹. *Alstonia scholaris R. Br*.

Myitkyina (C). DISTRIB. Tropics of Old World.

²⁶⁰* *Tabernaemontana coronaria R. Br*.

Myitkyina (C), DISTRIB. Generally cultivated in South-Eastern Ujjain, native country unknown, probably not wild in the Kachin

²⁶¹« *Holarrhena antidysenterica Wall*.

Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya.

²⁶²; *Vallisneria Heynei Spteng*.

²⁶³« *Vallisneria spiralis L.* (C). DISTRIB. India and Indo-China. Previously brought from the Taping Valley by Anderson.

263. *Pottsia cantoniensis* Hook. & Am.

Pala, 1,500 ft. (E). DiSTRIB. Assam; Burma; China; Malay^a.

264. *Aganosma cymosum* G. Don.

Pala, 1,500 ft. (E). DiSTRIB. Silhet 5 Cachar and Lus^{na}ich^h Hills. The Kachin plant is exactly the same as the Silhet one, wn constitutes *A. cymosum* proper.

LVI.—ASCLEPIADACE²E.

265. *Periploca calophylla* Fate.

Myitkyina (C). DiSTRIB. Himalaya; Assam Ranges; ^{china} ^ ^

This has not before been collected in Burma.

266. *Myriopteron paniculatum* Griff.

Myitkyina (C). DiSTRIB. Assam, Burma; Malaya.

267. *Asclepias Curassavica* Linn.

Patzam, 3,100 ft. (E); Myitkyina (Q. DiSTRIB. Native ^{or} st ^{je} West Indies, now a widespread weed in the Tropics.

268. *Cynanchum corymbosum* Wight.

Myitkyina (C). DiSTRIB. Eastern Himalaya; Assam; B^{ur}ma^a; Malaya. Previously collected at Poneline in the Taping Valley.

269. *Pentasacme caudatum* Wall.

Namli, 2,000 ft. (E). DiSTRIB. Assam Ranges and ^R ^B ^{ma} [^] ^{Va} previously obtained by Dr. Griffith during his Hukung journey.

270. *Hoya longifolia* Wall.

Neochawng, 2,500 ft. (E). DiSTRIB. Himalaya and ^{Assain} * Ranges; not before collected in Burma,

271. *Hoya parasitica* Wall.

Myitkyina (C). DiSTRIB. Assam Ranges; Burma; Andamaⁿg[;] Malaya.

272. *Ceropegia pubescens* Wall.

Myitkyina (C). DiSTRIB. Himalaya and the Assam R^{an}&^{re} ^s not before sent from Burma.

LVIIL—LOGANIACE[^]E.

273. *Gelsemium elegari* B Bth.

Myitkyina (E); (C). DiSTRIB. Though omitted from the ^f ^{*} ^o ^r ^a ^{cs} ^y [^] [^] of *British India*, this is very common in the mountain ^r ^{*} ^x [?] ^{va} ^{lle} [^] between Assam and Burma; it was collected in the Hukung by Griffith and at Poneshee in the Taping Valley by Anderson, extends northwards into China and recurs in Sumatra.

274. *Buddleia asiatica* Lour.

Namlao (E). DISTRIB. India; Indo-China; China; Malaya.

LVIII.—GENTIANACE/E.

²75- *Exacum teres* Wall.

Myitkyina (C). DISTRIB. Himalaya and the Assam Ranges ;
^{nu}* previously collected in Burma.

²76. *Exacum tetragonum* Roxb.

Myitkyina (C). DISTRIB. India; Himalaya; China. A distinct
 variety occurs in Lower Burma and Malaya; the Kachin plant is*
 " o ~~ever~~ ^W; the Himalo-Chinese and not the Malayan form.

LIX.—BORAGINEJE.

277. *Cynoglossum micranthum* Desf.

Myitkyina (C). DISTRIB. Northern India and the Himalayas to
 Indo-China and China.

LX.—CONVOLVULACE^E.

²78. *Ipomcea linifolia* DC.

Myitkyina (C). DISTRIB. Sikkim; Assam; Burma; Malaya ;
 Australia.

²79. *Ipomcea vitifolia* Sw.

Myitkyina (E); (C). DISTRIB. India; Indo-China ; Malaya.

280. *Evolvulus alsinoides* Linn.

^MMyitkyina (C), DISTRIB. Throughout the Tropics.

281. *Porana paniculata* Roxb.

^{Na}aili, 2,000 to 2,500 ft. (E). DisrRIB. India; Indo-China, Malaya.

²⁸2. *Porana racemosa* Roxb.

^{My}Myitkyina (C). DISTRIB. Himalaya; Assam Ranges ; Iodo-China ;
 China.

LXI.—SOLANACEM.

⁸³ Solanum barbisetum Nees, VAR. Griffithii Prain.

^{My}Myitkyina (C)- DISTRIB. (of the variety), Upper Assam ; also
^{the}the ^{Tapin}Tapin Valley and the ^{Hukin}Hukin Valley- ThThlough very different
^{fro}from ^mthe ^{^e}^e ^{^p}^pe, this hardly deserves to be considered a distinct
^{Sp}species.

³4. *Solanum biflorum* Lour.

^{Ch}China ^{eo}eo hawn & ^aa ⁱi ^oo ^ff (E); Myitkyina (C). DISTRIB. China ; Indo-
^{na}Malaya. Previously collected at Poneshee by Dr. J. Anderson.

⁸⁵ Solanum ferox Linn., VAR. inermis Prain.

^{My}Myitkyina (Q).

[*Physalis peruviana* Linn.—This was once seen in a garden during Lieutenant Pottinger's journey.]

286. *Nicotiana Tabacum* Linn.

Noichong to Phals, 1,300 to 2,000 ft. (E). DISTRIB. Native of America; cultivated in all warm countries. [Tobacco is very generally cultivated throughout the Kachin Hills; only this species was met with by Lieutenant Pottinger's party; *N. rotundifolia* appears to be unknown.]

LXII.—SCROPHULARINEAE.

287. *Torenia edentula* Griff.

Myitkyina (C), DISTRIB. Bihar; Sikkim; Assam; Burma; Malaya.

288. *Torenia flava* Ham.

Myitkyina (C). DISTRIB. Assam; Burma; China; Malaya.

289. *Torenia rubens* Benth.

Chesyan, 3,000 ft. (E). DISTRIB. Sikkim; Assam Ranges; also collected by Dr. Griffith during the Hukung Valley journey. This is in reality exceedingly distinct from the next species, though the two are united in the *Flora of British India*.

290. *Torenia vagans* Roxb.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; before collected in Burma. The Nilgiri locality cited in the *Flora of British India* is erroneous.

291. *Vandellia scabra* Bth.

Myitkyina (C). DISTRIB. Throughout Tropics of Old World.

29a. *Vandellia sessiliflora* Bth.

Myitkyina (C). DISTRIB. Bihar; Himalaya; Assam Ranges; Burma.

293. *Bonnaya reptans* Spreng.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

294. *Bonnaya veronicaefolia* Bth.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

295. *Centranthera hispida* R. Br.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia and Australia.

LXIII.—OROBANCHACEAE.

296. *Eginetia indica* Linn.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

LXIV.—LENTIBULARIEAE.

297. *Utricularia orbiculata* Wall.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

LXV.—GESNERACEJE.

298. *Eschynanthus grandiflora* Spreng., VAR. *longiflora* Prain.
Myitkyin (C). Agrees with the type, except that the flowers
are here 2-25 in. long.
299. *Eschynanthus levipes* C. B. Clarke.
Lakham, 4,100 ft, (E). DISTRIB. Previously known only from
the Mishmi Hills.
300. *Eschynanthus maculata* Lindl.
Neochawng, 7,000 ft, (E). DISTRIB. Previously only known
from the Eastern Himalaya.
301. *Eschynanthus micrantha* C. B. Clarke^ VAR. *Pottingeri*
Prain.
Namli, 2,000 ft. (E). DISTRIB. (of type) Sikkim. Capsules 10
in long, otherwise extremely like the original examples, which are
from Sikkim.
302. *Eschynanthus pusilla* Prain.
Myitkyina (C).
A very distinct species.
303. *Eschynanthus superba* C. B. Clarke.
Myitkyina (C). DISTRIB. Assam Ranges ; never before collected
in Burma.
304. *Rhynchotecham ellipticum* A. DC.
Myitkyina (C). DISTRIB. (of the type.) Malaya.
305. *Rhynchotechum ellipticum* A. DC, VAR. *angusta* Clarke.
Myitkyina (C). DISTRIB. (of the variety), Khasip., Karen Hillis ;
jjartaban.
306. *Rhynchotechum vestitum* H.f. & T.
Ran Mokong, 600 ft. (E). DISTRIB. Eastern Himalaya and Assam
anges; not before collected in Burma.
307. *Rhynchoglossuro obliquum* DC, VAR. *parviflora* Clarke.
Myitkyina (C). DISTRIB. (of the variety.) India; Himalaya; Assam
had ?^SS ^efc^P occurs in Tenasserim and Malaya ; neither form
a hitherto been collected in Upper Burma,
308. *Stauranthera grandiflora* Bth.
1^ Bank of the Tummao Kha, 700 ft. (E). DISTRIB. Indo-China and
al^y^> not before collected so far north.
309. *Didymocarpus elatior* Prain.
Myitkyina (C).
A rather striking species, most resembling *D. corchorifolia* from
Malaya. It has ^ same woody stems, but is otherwise very
distinct.

310. *Chirita pumila* Don.

Myitkyina (C), DISTRIB. Himalaya; Assam Ranges ; not before collected in Burma.

311. *Chirita speciosa* Kurz.

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. Taping Valley, where it was collected by Dr. J. Anderson, both at Poneshee and at Pone-line.

LXVL—BIGNONIACEJE.

312. *Mayodendron igneum* Kurz.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Assam Ranges; Indo-China; Taping Valley.

LXVIL—PEDALINE.E.

313. *Sesamum indicum* DC.

Banks of the Tummao Kha, 700 ft. (E). DISTRIB. Cultivated in all hot countries.

It is noted by Lieutenant Pottinger that oil-seed crops were conspicuously absent. The presence of this species in his collection and of *Perilla ocimoides* in that of the Calcutta Garden collector goes to show, however, that here and there patches of oil-seed do probably occur.

LXVIII—ACANTHACE^E.

314. *Thunbergia coccinea* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; Tenasserim ; not before from Upper Burma.

315. *Thunbergia lutea* T. And.

Myitkyina (C). DISTRIB. Eastern Himalaya ; not before reported from Burma.

316. *Thunbergia grandiflora* Roxb.

Myitkyina (C). DISTRIB. Eastern Bengal ; Assam Ranges ; collected also by Dr. J. Anderson in the Taping Valley and by Calcutta Garden collector in the Bhamo District.

317. *Nelsonia campestris* R.Br.

Myitkyina (C). DISTRIB. Throughout the tropics.

318. *Hygrophila salicifolia* T. And., VAR. *assurgens* Clar**.

Myitkyina (C). DISTRIB. (of the variety), Eastern Bengal ; Assam, Tenasserim and Malaya; not before sent from Upper Burma.

319. *Daedalacanthus tetragonus* T. And.

Namlao (E). DISTRIB. Burma; already collected in the Taping Valley by Dr. J. Anderson.

320. *Strobilanthes capitatus* T. And.

Myitkyina (C). DiSTRiB. Himalaya ; Assam Ranges; Karen Hills.

321. *Strobilanthes coloratus* T. And.

Myitkyina (C). DiSTRiB. Eastern Himalaya ; Assam Ranges ; not before collected in Burma.

322. *Strobilanthes pentstemonoides* T. And.

Myitkyina (C). DiSTRiB. Himalaya ; Assam Ranges ; Burma. Our specimens agree well with examples named *S. pentstemonoides* by Kurz, from Pegu and from the Taping Valley, but less exactly with those from the Himalaya so named by Dr. T. Anderson himself.

[*Strobilanthes flaccidifolius* Nees.-Though this plant was never actually seen by Lieutenant Pottinger's party, it is fairly certain that it occurs throughout the Kachin Hills and is the source of the blue dye used by the people. Dr. Griffith met with it in the neighbouring Hukisng Valley, and it is quite common in the mountains of Assam to the west, and in the Shan country to the south-east]

The identifications of the two first species of *Strobilanthes* must be accepted as tentative only. In neither instance do the specimens agree absolutely with sheets of those species as named by Dr. Thos. Anderson himself, or with any other sheets named or unnamed in the Calcutta Herbarium, though in both cases we believe that the name suggested represents the species to which our plants bear respectively the closest affinity.

323. *Acanthus leucostachyus* Wall.

Myitkyina (E); Namli, 2,000 to 2,500 ft. (E). DiSTRiB. Assam Ranges; also common in the Taping Valley.

324. *Asystasia Neesiana* Nees.

Myitkyina (C). DiSTRiB. Assam Ranges; Indo-China.

325. *Eranthemum indicum* Clarke.

Myitkyina (C). DiSTRiB. E&st Himalaya ; Assam Ranges ; Shan and Karen Hills.

326. *Eranthemum palatiferum*, Nees.

Namli, 2,000 ft. (E) ; Namli, 600 ft. (E). DiSTRiB. Eastern Himalaya; Assam Ranges; China; previously collected in the Taping Valley by Dr. J. Anderson.

327. *Eranthemum palatiferum* Nees. VAR. *elata* Clarke.

Myitkyina (C), DiSTRiB. Burma.

328. *Codonacanthus pauciflorus* Nees.

Bansparao, 2,000 ft. (E). DiSTRiB. Assam Ranges ; from Chittagong to Mishmi ; also in S. China; but not before collected in Burma.

329. *Andrographis tenuiflora* T. And.

Myitkyina (C). DiSTRiB. Assam Ranges; Burma.

330. *Phlogacanthus curviflorus* *Nees*.
Myitkyina (C). DISTRIB. Assam Ranges; Burma.
331. *Phlogacanthus Jenkinsii* *Clarke*,
Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. NagaTM {*Jenkins, Watt*); Bhamo (*J. Anderson*).
333. *Phlogacanthus pubinervius* *T. And**
Myitkyina (C). DISTRIB. Sikkim, Shan Hills.
333. *Phlogacanthus tubiflorus* *Nees*.
Myitkyina (C). DISTRIB. Daphla Hills; Assam Ranges; not be^o sent from Burma.
334. *Lepidgathis hyalina* *Nees*.
Myitkyina, 450 ft. (E). DISTRIB. India ; Indo-China ; China.
- 335- *Justicia procumbens* *Linn.*} VAR. *latispica* *Clarke**
Myitkyina (C). DISTRIB. India; Indo-China; China; Malaya ;^{Aus-} tralia,
336. *Adbatoda Vasica* *Nees*.
Ningting, 3,000 ft. (E). DISTRIB. Throughout South-Eastern^{^ s j a}
337. *Rhinacanthus calcaratus* *Nees.*} VAR. *maxima* *Prat**.
Myitkyina (C).
Leaves faintly puberulous on both surfaces, panicle dense,^{corolla-} tube 1/5 inch long ; capsule 2 inches long. Very possibly this s^{houl^} be considered a distinct species.
338. *Rungia stolonifera* *C.B. Clarke*.
Lammuk, 2,500 ft. (E). DISTRIB. Hitherto only known from^{the} Khasia Hills.
339. *Dicliptera Roxburghiana* *Nees*.
Lamrouk, 2,500 ft. (E). DISTRIB. India and Indo-China.

LXIX.-VERBENACE;E.

340. *Callicarpa arborea* *Roxb.*
Myitkyina (E); (C). DISTRIB. Northern India and Himal^{á - a} y »
Assam ; Indo-China ; Malaya,
341. *CaryopUris paniculata* *C.B. Clarke**
Myitkyina (E). DISTRIB. Eastern Himalaya and Assam Range^{s .} \$
also Taping Valley.
[*Tectona grandis* *Linn, fil.*—The teak, though present at My^{it} kyina, is not plentiful, and the trees are gnarled and stunted,^{it} does not occur further north.]
342. *Premna herbacea* *Roxb.*
Myitkyina (C). DISTRIB. India; Himalaya; Assam Ranges; Burma.
- 343- *Premna milleflora* *CM. Clarke*.
Myitkyina (C); DISTRIB. Hitherto only known from Assam.

- 344- *Gmelina arborea Roxb.*
Phalé, 1,300 to 3,300 ft. (E). DISTRIB. South Eastern Asia, not extending into China.
- 345- *Vitex glabrata R* Br.*
Myitkyina (C). DISTRIB. Assam ; Indo-China ; Malaya; North Australia.
346. *Clerodendron Colebrookeanum Wall**
Myitkyina (C). DISTRIB. Eastern Himalaya, Assam Ranges, Indo-China, Malaya.
- 347- *Clerodendron Griffithianum C.B. Clarke.*
Namlao to Bansparao, 500 to 2,000 ft. (E); Myitkina (C). DISTRIB. Hukung Valley, *Griffith* ; Taping Valley, *J. Anderson.*
348. *Clerodendron infortunatum Gaertn**
Myitkyina (C); Bansparao, 2,000 feet (E). DISTRIB. India, Indo-china, Malaya.
349. *Clerodendron lasiocephatum C. B. Clarke.*
Namli, 2,000 to 2,500ft. (E). DISTRIB. Assam Ranges from Jaintia to Mishmi; also occurs among Dr. J. Anderson's specimens from the Taping Valley.
350. *Clerodendron nutans Wall.*
Namlao to Bansparao, 500 to 2,000 ft. (E); Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges, also among Dr. J. Anderson's plants from the Taping Valley.
351. *Clerodendron serratum Spreng.*
Myitkyina (C). DISTRIB. India and Indo-China.
352. *Sphenodesma pentandrum Jack**
Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Assam ranges ; China; Indo-China; Malaya.
353. *Congea tomentosa Roxb.*
Myitkyina, 450 ft. (E). DISTRIB. Chittagong; Burma from Hukung southwards ; Indo-China.

LXX.—LABIATE.

354. *Geniosporum strobiliferum Wall**
Myitkyina(C). DISTRIB. Himalaya; Assam Ranges; Shan Hills.
355. *Acrocephalus capitatus Btk.*
Myitkyina (C). DISTRIB. India; Indo-China; Malayan Archipelago.
356. *Orthosiphon stamineus Bth.*
Myitkyina (C). DISTRIB. India; Indo-China; Malaya.
357. *Plectranthus Coetsa H a. m.*

- Myitkyina (C). DiSTRIB. Himalaya ; Assam ; Burma.
358. *Plectranthus hispidus* *Bth.*
Myitkyina (C)« DISTRIB. Assam Ranges and Shan Plateau ;
China.
359. *Plectranthus ternifolius* *Don.*
Myitkyina (C). DiSTRIB. Bihar ; Himalaya; Assam ; Burma an^a
China.
360. *Dysophylla Auricularia* *DC.*
Myitkyina (C). DiSTRIB. throughout South-Eastern Asia.
361. *Colebrookia oppositifolia* *Sm.*
Bansparao, 2,000 ft. (E); Myitkyina, 450 ft. (E). DiSTRIB* India
and Indo-China.
362. *Perilla ocimoides* *Linn,*
Myitkyina (C). DiSTRIB. Himalaya ; Assam Ranges; Burma ;
China.
363. *Scutellaria glandulosa* *Hook. fil*
Namli, 2,000 ft. (E). DiSTRIB. Hukung Valley; Shan P»^{tc} au ;
Chin Hills.
364. *Achyrospermum Wallichianum* *Bth.*
Myitkyina (C). DiSTRIB. Eastern Himalaya ; Assam Ranges ;
Burma.
365. *Notochaete hamosa* *Bth.*
Myitkyina (C). DiSTRIB. Eastern Himalaya; Naga u|||s
{*Pram*); never before sent from Burma.
366. *Leucas hyssopifolia* *Bth.*
Myitkyina (C). DiSTRIB. Himalaya; Burma; not sent from As»a^{m§}
367. *Leucas mollissima* *Wall.*
Myitkyina (C). DiSTRIB. India; Indo-China; China.
368. *Gomphostemma lucidum* *Wall.*
Myitkyina (C). DiSTRIB. Assam Ranges; also previously m - col.
lected in the Taping Valley by Anderson.
369. *Goraphostemma nutans* *Hook, fil*
Myitkyina (C). DiSTRIB. Khasia Hills and Chin Hills.
370. *Gomphostemma parviflorum* *Wall. VAR. farinosa* *Pf*^{fi}
Myitkyina (C). DiSTRIB. Assam Ranges; not before collected
- Burma.
371. *Leucosceptrum canum* *Sm.*
Namli, 3,000 to 2,500 ft. (E). DiSTRIB. Himalaya; Assam
Ranges; also previously collected by Dr. J. Anderson in the Taping
Valley and by a Calcutta Garden collector in the Ruby Mies
District of Upper Burma.
372. *Teucrium stoloniferum* *Roxb.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Burma; China.

373» *Ajuga macrosperma* Wall. VAR. *breviflora* Hook. f.

Myitkyina (C). DISTRIB. Parasnath, Himalaya; Assam Ranges; before collected in Burma though typical *A. macrosperma* has been. This is probably a good species; if so considered, the name to be used for it is *Ajuga sikkimensis* Miq.

LXXI.—PLANTAGINACEAE.

374* *Plantago major* Linn.

Myitkyina (E). (C); DISTRIB. Cosmopolitan.

Incomplete.

LXXII.—AMARANTACEAE.

375. *Deeringia celosioides* Moq.

Myitkyina (Cj. DISTRIB. Throughout South-Eastern Asia; also in Australia.

376. *Amarantus paniculatus* Linn.

Myitkyina (C). DISTRIB. Cultivated, or an escape; in the Tropics of Old World.

377; *Aerua scandens* Wall.

Myitkyina (E). DISTRIB. Throughout Tropics of Old World.

378. *Gomphrena globosa* Linn.

Myitkyina (E). DISTRIB. Throughout the Tropics cultivated, or escape; probably originally American.

LXXIII.—POLYGONACEAE.

379. *Polygonum alatum* Ham.

Myitkyina (Q. DISTRIB. India; Indo-China; China; Japan; Abyssinia.

380. *Polygonum chinense* Linn.

Myitkyina (E); Lammuk, 2,500 ft. (E); Myitkyina (E); (C). DISTRIB. Throughout South-Eastern Asia.

381. *Polygonum runcinatum* Ham.

Myitkyina (C). DISTRIB. Himalaya; Assam; China; Java; not before collected in Burma.

382. *Polygonum viscosum*, Ham.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; China; before collected in Burma.

383* *Pagopyrum cymosum* Meissn.

Myitkyina, wild (C). DISTRIB. Himalaya; Assam, ^{R&^es J} China; already also collected in Taping Valley. Perhaps this ^w more than the next species in a wild state, the produce of ^{seeds} washed down from the higher Hills.

[*Fagopyrum esculentum* Moench.—Buckwheat is very ^{8^{cnc} r^{*} h^{ef}} cultivated throughout the Kachin Hills, especially in the nig ^{jj_y} villages,]

LXXIV.-PIPERACE2E.

384. *Piper boehmerisefolium* DC,
Myitkyina (C). DISTRIB. E. Himalaya; Assam Ranges; ^{Burma}

385. *Piper Kingianum* Prain,
Myitkyina (C). DISTRIB. Taping Valley, where it was ^{originally} collected by Dr. J. Anderson.

A very distinct species,

LXXV.-CHLORANTHACE^E.

386. *Chloranthus brachystachyus* Meissn*
Neochawng, 7,000 ft (E). Myitkyina (C). DISTRIB. ^{Thro^{gh}out} South-Eastern Asia, but apparently absent from the ^{H^{imal}ayan} Ranges west of the Daphla Hills.

LXXVI.—LAURINE/E.

387. *Phcebe attenuata* Nees.
Namlao to Bansparao, 500 to 2,000 ft. (E); Namli, ^{to ^00} 2,000 ^{mai} ft. (E); near Myitkyina, 5,000 ft. (E). DISTRIB. Eastern Hi [^] Assam Ranges; not before collected in Burma.

388. *Phcebe pamculata* Nees.
Myitkyina (C). DISTRIB. India; Indo-China ; not in Him[^] ^{ya<>^r} in Assam.

389. *Actinoiaphne sikkimensis* Meissn.
Myitkyina (C). DISTRIB. E. Himalaya, Manipur; no ^{hef^re} sent from Burma.

390. *Litsaea polyantha* Juss,
Kepio, 2,900 ft. IE). DISTRIB. India; Himalaya | Indo- ^{f . r^{ina} i} China; Malaya.

391. *Litsaea salicifolia* Roxh. VAR. *ellipsoidea* Meissn*
Namli, 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam R^{an} ^{^st} not before sent from Burma.

392. *Litssea schifera* Pets.
Myitkyina (C). DISTRIB. Throughout South-Eastern Asia ^{^nd} in Australia.

- 393* *Lindera assamica* Kurz
 Neochawng, 2,500 ft. (E). DISTRIB. Assam Ranges ; also previously collected at Poneline in the Taping Valley.

LXXVII.—THYMELEJE.

- 394- *Wikstroemia canescens* Meissn.
 Myitkyina (C). DISTRIB. Ceylon; Himalaya; Assam; Shan Hills; {*King's Collectors*}; China.
 395* *Daphne pendula* Sm.
 Myitkyina (C). DISTRIB. Karen Hills ; Pegu; Malay Islands not before met with so far north.

LXXVIII.—LORANTHACEAE.

396. *Loranthus involucratus* Roxb.
 Myitkyina (E), DISTRIB. Himalaya: Assam Ranges; from Chittagong northwards.
 397. *Loranthus pentapetalus* Roxb.
 Myitkyina (C); Palá, 1,500 ft (E). DISTRIB. Himalaya; Assam Ranges ; China; Indo-China; Malaya.

LXXIX.—EUPHORBIACEAE.

393. *Bridelia pubescens* Kurz > VAR. *glabra* Prain.
 Namli, 2,000 to 2,500 ft. (E). DISTRIB. Taping Valley.
 Previously obtained at Poneshee by Dr. J. Anderson ; it has precisely the fruits of *B. pubescens*, with leaves of the same size and shape and with similar venation. It differs in having the leaves skucous and quite glabrous beneath.
 399* *Sauropus albicans* DC.
 Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.
 400. *Glochidion assamicum* Hook. f. & Th.
 Namli, 2,000 to 2,500 ft, (E). DISTRIB. Himalaya ; Assam Ranges; from Chittagong northwards ; also previously collected by Griffith in the Hukung Valley.
 401. *Glochidion villicaule* Hook. f. & Th.
 Myitkyina (C). DISTRIB. Hukung Valley {*Griffith*} ; Taping Valley {*Anderson*} | Malay Peninsula.
 402. *Fluggea microcarpa* DC.
 Myitkyina (C). DISTRIB. Warmer parts of Eastern Hemisphere.
 403* *Aporosa oblonga* Muell-Arg.
 Myitkyina (C). DISTRIB. Assam Ranges; Burma.
 404. *Aporosa Roxburghii* Muell-Arg.

Ningting, 3,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges ; Burma,

405. *Daphniphyllum himalayense* Muell.-Arg.

Himalaya; Assam Ranges.

406. *Antidesma Ghaesembhilla* Gaertn.

Myitkyina (C). DISTRIB. Tropics of Old World.

407. *Croton oblongifolius* Roxb.

Namli, 2,000 ft. (E). DISTRIB. India; Assam; Burma; ^{JD} <>^c

the Himalaya proper.

408. *Acalypha* ? sp.

Lammuk, 2,500 ft. (E).

Very distinct from anything in the Calcutta Herbarium, D ^m ^{ut too}

incomplete for description.

409. *Mallotus alba* MuellArg,

Mokong, 600 ft. (E). DISTRIB. E. Himalaya; and Assam ^{Ranges ;} from Chittagong northwards ; never before reported from Bur ⁿ

410. *Mallotus nepalensis* Muell.-Arg.

Neochawng, 1,000 ft. (E). DISTRIB. E. Himalaya ^{and Assam} Ranges ; from Chittagong northwards; never before reported from ^{rted from} Burma.

411. *Macaranga denticulate* Muell.-Arg*

Neochawng, 7,000 ft. (E). DISTRIB. Himalaya ; A ^{ssain} ^{t jndo-} China; Malaya.

412. *Homonoia riparia* Lout,

Myitkyina (C). DISTRIB. India, Indo-China; Malaya ; ^{China.}

413. *Baliospermum micranthum* Muell*Arg+

Myitkyina (C). DISTRIB. Khasia Hills; Chin Hills ^{(Calcutta} Garden Collectors),

414. *Riciauscommunis* Linn*

Myitkyina (E). DISTRIB. Generally cultivated in ^{the} ^{tropics ;} probably a native* of Africa.

This was also seen at various villages, but always near ^r ^{the fron-} tier; the seeds are used for their oil, but the oil is not ^{employed} medicinally.

415. *Gelonium multiflorum* A. Juss.

Myitkyina (C). DISTRIB. Throughout Southeastern ^{Asia,}

LXXX.-URTICACE/E.

416. *Gironniera reticulata* T/iwaites.

Namli, 2,000 to 2,500 ft. (E). DISTRIB. India; Indo-Chm ^{a. Java.}

417* *Cannabis sativa* Linn,

Maté, 1,500 (E)., apparently wild. DiSTRIB. Cultivated, or an escape in temperate and tropical regions.

The uses of this plant appeared to Lieutenant Pottinger to be unknown to the Kachins.

4*8, *Streblus asper* Lour.

Myitkyina (E). (C). Banks of the 'Nmai Kha, 900 ft. (E). DiSTRIB. Throughout South-Eastern Asia in the drier parts.

[*Morus indica* Linn.—This was plentiful near Galing Village in the Upper Valley of the Nachawng Kha; no specimens were brought away.]

4>9* *Ficus clavata* Roxb.

Myitkyina (C). DiSTRIB. Himalaya; Assam Ranges; Indo-China, Malaya.

420. *Ficus clavata* Roxb, VAR. *trachycarpa* Wall (sp.)_B

Myitkyina (C). DiSTRIB. Assam Ranges.

[*Ficus clavata* Roxb.—Met with, but by no means plentifully, south of the Tumpang Kha.]

421. *Ficus hirta* Vahl.

Myitkyina (C); Shigu Ferry, 800 ft (E). DiSTRIB. Eastern Himalaya; Assam Ranges : Indo-China ; China ; Malaya.

422. *Ficus hirta* Vahl., VAR. *Roxburghii* King.

Nawgo Kha, 1,300 to 2,000 ft. (E) ; Myitkyina (C). DiSTRIB. Eastern Himalaya; Assam Ranges; Indo-China; China; Malaya.

423. *Ficus mysorensis* Heyne^ VAR. *subrepanda* King.

Myitkyina (C), DiSTRIB. (of the variety), Himalaya; Assam Ranges; Burma.

424. *Ficus obscura* DC.

Myitkyina, 450 ft. (E); Larr.muk, 2,500 ft. (E), DiSTRIB. Eastern Himalaya; Assam Ranges; Burma ; Malaya.

425. *Ficus obtusifolia* Roxb.

Myitkyina (C). DiSTRIB. Eastern Himalaya; Assam; Indo-China; Malaya.

426. *Cudrania fruticosa* Tree.

Myitkyina (C). DiSTRIB. Assam Ranges; Burma.

427» *Conocephalus suaveolens* DC.

Namli, 2,000 ft. (E). DiSTRIB. Eastern Himalaya; Assam Ranges, Burma and ~~Assam~~.

428. *Pilea bracteosa* Wedd.

Myitkyina (C). DiSTRIB. Himalaya ; Assam Ranges ; not previously reported from Burma.

4*9. *Boehmeria macrophylla* Don.

Namli, 2,000 to 2,500 ft. (E). DiSTRIB. Himalaya; Assam Ranges;

also previously collected by Dr, J. Anderson in the Taping Valley.

430. *Boehmeria platyphylla* Don.

Myitkyina (E) ; Namlao (E). DiSTRiB. Tropics of Old World.

431. *Boehmeria platyphylla* Don. VAR. *scabrella* Wedd.

Myitkyina (C). DiSTRiB. India; Himalaya; Assam; not before collected in Burma.

432. *Elatostema papillosum* Wedd.

Neochawng, 2,500 ft. (E). DiSTRiB. Assam Ranges; before collected in Burma.

433. *Elatostema platyphyllum* Wedd.

Namli, 2,000 to 2,500 ft. (E). DiSTRiB. Eastern Himalaya; Assam Ranges; not before collected in Burma.

434. *Elatostema rupestre* Wedd.

Nawgo Kha, 1,300 to 2,000 ft. (E). DiSTRiB. Himalaya ; Assam Ranges ; Burma; Malay Islands.

435. *Maoutia Puya* Wedd.

Myitkyina (C). DiSTRiB. Himalaya; Assam Ranges; Burma; Sumatra.

LXXXI.—JUGLANDEAE.

[*Juglans regia* Linn.—The walnut is cultivated by the along the Kachin frontier.]

Juglans sp.—A walnut that differs markedly from the tree in having a very hard shell, which it is almost break, is planted in many of the villages throughout the Hills. It seemed in other respects to be only a form of the species. Lieutenant Pottinger's party did not bring any specimens.

436. *Engelhardtia spicata* DC.

Myitkyina (E). DiSTRiB. Himalaya ; Assam Ranges; Malaya.

LXXXII.—CUPULIFERAE.

437. *Castanopsis tribuloides* A, DC.

Myitkyina (C). DiSTRiB. Himalaya, Assam Ranges; Burma.

438. *Alnus nepalensis* Wall.

Myitkyina (C). DiSTRiB. Himalaya; Assam Ranges. from the Taping Valley and from the Kachin and Chin Hills; not from elsewhere in Burma.

439. *Betula alnoides* Ham.

Myitkyina (C). DiSTRiB. Himalaya; Assam Ranges; [Several Oaks and Chestnuts were seen by Lieutenant Pottinger's party, but no specimens could be brought One chestnut in particular]

planted near villages on the Chinese frontier, did not seem to differ in any way from the familiar European tree.]

LXXXIII.—SALICINE/F.

440. *Salix tetrasperma* Roxb.
Myitkyina (C). DISTRIB. India; Indo-China; Malaya*

LXXXIV.—GNETACEAE.

- 44'. *Gnetum Gnemon* Linn.
Namlao to Bansparao, 500 to 2,000 ft. (E); Patzam, 1,100 ft. (E); Myitkyina (C). DISTRIB. Assam Ranges; Malaya; not before collected in Burma.

CONIFERS.

[Two conifers were met with, as described in the Introduction, on the high ranges near the head-waters of the Lakhing Kha and Nawachang Kha. One of these was a Pine, most probably *Pinu*; *Rhasya*; the other a fir, the genus to which it belongs being uncertain. As Lieutenant Pottinger has already explained, the party were unable to collect or bring away specimens during the part of the journey that lay over these ranges.]

MONOCOTYLEDONES.

LXXXV.—ORCHIDACEAE.

442. *Microstylis biaurita* Lindl.
Myitkyina (C). DISTRIB. Previously only known from the Khasia Hills.
443. *Oberonia iridifolia* Lindl.
Nsentaru, 600ft (E). DISTRIB. India; Indo-China,
444. *Oberonia* sp.
Neochawng, 7,000 ft (E).
*ⁿ fruit only, and not identifiable; perhaps nearest *O. Falconeri*.
- 445* *Liparis longipes* Lindl.
Ummuk, 2,500ft. (E); Chesyan, 3,000 ft (E); Myitkyina (C).
DISTRIB. India; Indo-China; China; Malaya.
446. *Dendrobium cariniferum* Roxb.
Myitkyina (E). DISTRIB. Naga Hills; Manipur; Shan Hills; from
B. Bai*o southwards.
447. *Dendrobium chrysanthum* Wall.
Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges;
Shan Plateau.

448. *Dendrobium cretaceum* Lindl.
Myitkyina (E). DISTRIB. Western Himalaya; Assam Rang^{e g},
Burma; Andamans.
449. *Dendrobium Falconer!* Hook*
Myaungjong, 1,000 ft. (E). DISTRIB. Bhootan; Assam Rang^{e s},
Upper Burma.
450. *Dendrobium lituiflorum* Lindl.
'Nsentaru, 600 ft. (E). DISTRIB. Assam Ranges; Burma.
451. *Dendrobium nobile* Lindl. **Assam**
Lammuk, 2,500ft. (E). DISTRIB. Eastern Himalaya;
Ranges; China; not previously collected in Burma.
452. *Dendrobium Pierardi* Roxb. **Burma***
Ningting, 900 ft. (B) DISTRIB. Eastern Himalaya; Assam;
453. *Dendrobium transparens* Wall. **s. not**
Namli, 2,000 ft. (E). DISTRIB. Himalaya ; Assam Range >
before sent from Burma.
454. *Dendrobium Wardianum* Warner.
Myitkyina (E). DISTRIB. Assam Ranges, Burma.
455. *Dendrobium papilliferum* King & Pantling*
Myitkyina (C),
456. *Bulbophyllum Careyanum* Spreng. **Ranges;**
Myitkyina (E); (C). DISTRIB. Eastern Himalaya; Assam
Burma.
457. *Bulbophyllum leopardinum* Lindl. **Easter¹¹**
Mate, 1,500 ft. (E); Myaungjong, 800 ft. (E). DISTRIB-
Himalaya; Assam Ranges; not before sent from Burma.
458. *Bulbophyllum reptans* Lindl. **Assam**
Neobawng, 7,000ft. (E). DISTRIB. Eastern Himalaya ;
Ranges; not before collected in Burma.
459. *Bulbophyllum suavissimum* Rolfe.
Myitkyina (E). DISTRIB. Upper Burma.
460. *Bulbophyllum fimbrilligerum* King & Pantling*
Myitkyina (C.)
461. *lone kachinensis* King & Pantling.
Myitkyina (C).
462. *Cirrhopetalum maculosum* Lindl. **s. not**
Lammuk, 2,500 ft. (E) DISTRIB. Himalaya; Khasi HiH^s •
before collected in Burma.
463. *Cirrhopetalum refractum* Zoll.
Myitkyina (E). DISTRIB. Himalaya; Tenasserim; Java.
464. *Eria clavicaulis* Wall.
Myitkyina (C). DISTRIB. Khasia; not before sent from Burma*

465. *Eria paniculata* Lindl

Myitkyina (C). DiSTRrc. Himalaya'; Assam Ranges; not before collected in Burma.

466. *Eria pannea* Lindl,

Lammuk, 2,400 ft (E); Hankow, 500 ft. (E); Myitkyina (C).
DISTRIB. Himalaya; Assam Ranges; Tenasserim; Malaya; not previously obtained so far north.

467. *Eria stricta* LindL

Myitkyina (E). DISTRIB Himalaya; Assam Ranges; also in Siam
but not before collected in Burma.

468. *Pachystoma senile* Reichb* fil.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya; S. China.

469. *Spathoglottis pubescens* Lindl,

Myitkyina (C). DISTRIB. Assam Ranges; Indo-China; China.

470. *Phajus albus* LindL

Myitkyina (C). DISTRIB. India; Himalaya; Indo-China.

471. *Nephelaphyllum* sp.

Bansparao, 2,000ft. (E.)

A handsome plant with beautifully mottled leaves, nearest to *N* pulchrum* Benth. but evidently distinct. Unfortunately there are no flowers and it cannot be described*

472. *Tainia viridifusca* Benth.

Myitkyina (E). DISTRIB. Assam, Burma.

473* *Anthogonium gracile* LindL

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China*

474- *Agrostophyllum khasianum* Griff.

Nsentaru, 600 ft. (E). DISTRIB. Assam Ranges, Burma,
Andamans; also recently found in Sikkim.

475. *Ccelogyne Gardneriana* LindL

Lakham, 4,100 ft (E). DISTRIB. Himalaya; Assam Ranges; Karen
Hills; not previously found so far north.

476. *Ccelogyne graminifolia* Par. fy Rchb. f.

Namli, 2,000 ft (E). DISTRIB. Assam Ranges; Tenasserim; not
before found so far north.

477- *Ccelogyne* sp.

Neechowgr, 7,000 ft. (E). Nearest *C. ochracea*, but quite
distinct from any species in the Herbarium at Calcutta, though the
material hardly permits of description.

478. *Otochilus fusca* LindL

Neechowgr, 7,000 ft. (E); Myitkyina (E). DISTRIB. Himalaya ;
Assam Ranges; not before collected in Burma.

479. *Pbolidotaimbricata* ZiW/.

Patzam, 1,100 ft., *Myittha* (E) < DISTRIB. India, Himalaya;

486. *Pholidota rubra* *Wendl.*
 Laknam, 4,000 ft. (Rj. *Myittha* DISTRIB. Eastern Himalaya; Assam Ranges; also previously reported by Griffith during his Hokong

487. *Calthea* *Winkl.* *Myittha* (E) < DISTRIB. Assam Ranges; not previously reported from Burma.

L A T

(E) - DISTRIB. Sikkim, Nepal, India, China, Burma, Java, Sumatra, Borneo, Malaya, Philippines, etc. Another distinct form has been reported by Dr. Watt. The plant differs somewhat in coloration from the type. *Myittha* (E) < DISTRIB. Eastern Himalaya; Assam Ranges; not before reported from Burma.

485. *Eulophia nuda* *Z.* *Myittha* (E) < DISTRIB. India, Himalaya; Assam & Ranges; not before reported from Burma.

Himalaya; Indo-China. *Myittha* (E) < DISTRIB. India, Himalaya; Assam & Ranges; not before reported from Burma.

485. *Eulophia nuda* *Z.*

Burma, India, Himalaya; Assam & Ranges; not before reported from Burma.

Myittha

487. *Labk*

Assam Ranges. DISTRIB. W type), Eastern Himalaya and

E S f i t ; C 4 ^ of the
 This is no doubt refer. *Myittha* (E) < DISTRIB. India, Himalaya; Assam & Ranges; not before reported from Burma.

- but the material is insufficient for absolute determination; VAR.
^P**riskii* is a native of the Karen Hills.
488. *Geodorum dilatatum*, *R* Br.*
 Myitkyina (C). DISTRIB. India and Indo-China.
489. *Rhyncostylis retusa* *DC.*
 Myitkyina (C) DISTRIB. India; Indo-China; Malaya.
490. *Sarcochilus* sp.
 Myitkyina (C).
491. *Aerides Fieldingii* *Lodd.*
 Myaungjong, 800ft. (E); Kepio, 2,900 ft. (E). DISTRIB. Eastern Himalaya and Assam; not before reported from Burma.
492. *Aerides multiflorum* *Roxb.*
 Namlao to Bansparao, 500 to 2,000 ft (E). DISTRIB. Eastern Himalaya ; Assam Ranges and Tenasserim; not previously reported from Upper Burma.
493. *Vanda Bensoni* *Batem.*
 Nsentalu, 3,000 to 3,200 ft. (E). DISTRIB. Indo-China.
- 494* *Vanda teres* *Lindl.*
 Myitkyina (C). DISTRIB. Base of Eastern Himalaya ; Assam ; Burma; Andamans.
- 495- *Saccolabium gemmatum* *Lindl.*
 Lammuk, 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; not before sent from Burma.
496. *Saccolabium papillosum* *Lindl.*
 Namli, 2,000 ft. (E). DISTRIB. The Circars; Himalayas; Assam and Burma.
497. *Saccolabium obliquum* *Lindl.?*
 Myitkyina (C). DISTRIB. Burma? Our example is in fruit only and cannot be absolutely determined.
498. *Saccolabium Cruddasianum* *King & Pantling.*
 Myitkyina (C).
499. *Sarcanthus filiformis* *Lindl.*
 Pui-gwa Tungsa, 3,100 ft. (E); Myitkyina (C). DISTRIB. Eastern Malaya; Assam Ranges; Burma.
500. *Sarcanthus pallidus* *Lindl.*
 Pui-gwa Tungsa, 3,100 ft. (E); Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges; Burma.
501. *Ornithochilus fuscus* *Wall.*
 Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; China.
502. *Vanilla* sp.
 Myitkyina (E). DISTRIB. Chittagong.

In foliage nearest to *V. Moonti* but apparently; quite; distinct.
 The same plant occurs in the Herbarium at Calcutta, from Chittagong' unfortunately neither example suffices for descriptive purposes.

503. *Tropidia curculigoides Lindl*

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Rang^e; Burma; Malaya?

504. *Goodyera procera Hook,*

Kepio, 2,900 ft. (E); Myitkyina (E). DISTRIB, India; r¹ J⁰-
 China; China; Malaya.

505. *Pogonia carinata Lindl*

Myitkyina (C). DISTRIB. Throughout peninsular India aⁿ in
 the plains of Burma; absent from the Himalaya.

506. *Pogonia Juliana Wail.*

Myitkyina (C). DISTRIB. Plains of India and Assam; no^{t before}
 reported from Burma.

507. *Epipogum nutans Rchb.fil*

Myitkyina (C). DISTRIB. India; Himalaya : A s s * m ; Mal^{*ya};
 not before sent from Burma. Also found in Africa and Aus^tra^lia.

508. *Habenaria constricta Hook.*

Myitkyina (C). DISTRIB, Eastern Himalaya; Assam Rang^e s a[^]
 Tenasserim; not before sent from Upper Burma_a

509. *Habenaria Cruddasiana Prain.*

Myitkyina (C).

A distinct species; very nearly related to *H* reft** ^{forms} from
 the Assam Ranges.

510. *Habenaria Galeandra Benth**

Myitkyina (C). DISTRIB. India; Himalaya,; Burma; Chm^a

511. *Habenaria gen icul at a Don.*

Myitkyina (C). DISTRIB. Himalaya, Assam Ranges ; Burma.

512. *Habenaria Helferi Hook* fit.*

Myitkyina (C). DISTRIB. Assam Ranges, Burma.

513. *Habenaria furfuracea Hook.fil*

Myitkyina (C). DISTRIB. Khasia Hills; not before collec^ted in
 Burma.

514. *Habenaria Parishii, Hook, fit.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Andamans; Burma.

515. *Habenaria Susannae !?. Br.*

Myitkyina (C). DISTRIB. India ; Indo-China; Malaya[^] China.

516. *Habenaria Pottingeriana Kin% fy Pantling.*

Myitkyina (C).

Near *H. aristata*, but the lateral lip-segments very much

517. *Habenaria trichosantha Wall,*

Myitkyina (C). DISTRIB. Burma; previously collected by Anderson in the Taping Valley.

518. *Apostasia Wallichii* Br.

Myitkyina (C), DISTRIB, Himalaya ; Assam Ranges j Indo-China; Malaya; New Guinea; Ceylon.

LXXVL-SCITAMINEiE.

519. *Globba multiflora* Wall.

Myitkyina (E); (C). DISTRIB. Eastern Himalaya; Assam Ranges; not before sent from Burma.

520. *Globba sessiliflora*, Wall.

Myitkyina (E). DISTRIB. Burma.

521. *Hemiorchis Pantlingii* Ring.

Noichong to Phale*_f 1,300 to 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; nearly allied to, but quite different *_{ro}m, // *burmannica* Kurz of Pegu.

5²2. *Curcuma aromatica* Salisb.

Myitkyina (March 1897) (E). DiSTRiB. India; Indo-China.

5²3» *Curcuma plicata* Wall.

Myitkyina (June 1897.) (C). DiSTRIB. Burma.

524. *Curcuma Roscoeana* Wall.

Myitkyina (C). DiSTRIB. Burma.

525. *Gastrochilus longflora* Wall.

[^] Myitkyina (Cj. DiSTRIB. Eastern Himalaya; Assam Ranges; _{Bur}ma; Malaya.

526. *Gastrochilus pulcherrima* *ft all.*

%ftkyina (C). DISTRIB. Burma; Mabya.

537. *Kaempferia marginata* Wall.

Myitkyina (C). DiSTRIB. Indo-Cbina; Malaya.

528. *Kaempferia rotunda* Linn.

Myit~~ky~~ia (C). DiSTRIB. India; Himalaya; Indo-China; Malaya.

529. *Hedychium coccineum* Ham.

Myitkyina (Q DISTRIB. Himalaya; Assam Ranges; previously collected in the Taping Valley but not elsewhere in Burma.

53°. *Hedychium coronarium* Kcenig.

^MMyitkyina (C). DiSTRIB. India; Indo-China; Malaya.

53^f. *Hedychium luteum* Herb. Calcutta.

Myitkyina (C). DiSTRIB. Assam; not before sent from Burma.

§₃²; *Zingiber capitatum* Roxbu VAR. *elata* Bak.

^{before} Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; not sent from Burma.

533. *Zingiber chrysanthum Roscoe.*

Myitkyina (C). DISTRIB. Eastern Himalaya from Sikkim

Daphla Hills; not before sent from Burma.

534. *Zingiber Zerumbet Sm.*

Myitkyina (C). DISTRIB. India; Indo-China; Malaya; China.

535- *Alpinia Galanga Sm%*

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

LXXXVII—H/EMODARCE2E.

536. *Ophiopogon cordylinoides Prain.*

Namli, 2,000 ft. (E) ; Myitkyina (E), (C).

537. *Ophiopogon Wallichianus Hook.f.*

Neochawng, 7,000 ft. (E). DISTRIB. Himalaya; Assam *^R & ^{-e5;} ^{**&} ^{Taping}

Shan Plateau and Karen Hills. Previously collected in the Valley.

LXXXVIII—AMAR YLLIDACE^E.

538. *Hypoxis aurea Lour.*

Myitkyina (C). DISTRIB. India; Indo-China; China; Malaya.

LXXXIX—TACCACE^I,

539. *Tacca laevis Roxb.*

Myitkyina (C). DISTRIB. India; Indo-Chioa ; Malaya.

XC—DIOSCOREACEiE.

540. *Dioscorea oppositifolia Linn.*

Namlao (E) ; Myitkyina (C); DISTRIB. India; ^{Himalaya ;} Assam Ranges; not before sent from Burma.

541. *Dioscorea Daemona Roxb.*

Myitkyitia (C). DISTRIB, General in forests of South-East ^{Asia.}

XCI—LILIACEiE.

542. *Smilax ferox Wall.*

Lammuk, 2,500 ft. (E). DISTRIB. Himalaya; Assam ^{Rang^{es}l,} K Indo-China.

543. *Smilax lanceaefolia Roxb.*

Namlao to Bansparao, 500 to 2,000 ft. (E); Palá, 5° ^{it, (E).} Chipwi Kha, 1,000 ft. (E). DISTRIB, Himalaya; Assam Ranges| ^{Indo-} China; China.

544. *Smilax Roxburghiana Wall,*

Myitkyina (C). DISTRIB. Bihar; Himalaya; Assam ^{Ranges;} not before sent from Burma.

545- *Smilax macrophylla* Roxb.

Myaungjong (E). DiSTRIB. India ; Indo-China.

546. *Tupistra aurantiaca* Wall,

Palá, 1,500 ff. (E). DiSTRIB. Eastern Himalaya; Ausam Ranges; not before sent from Burma.

547* *Dracaena ensifolia* Wall.

Namlao to Bansparao, 500 ft. to 2,000 ft. (E) ; Namli, 2,000 ft. (fc). DiSTRIB. Himalaya; Assam Ranges ; Indo-China.

This species is sometimes united with *D. angustifolia* Roxb; the two are however remarkably distinct. The present plant is an underbrush common at from 2,000 to 4,500 feet throughout the Eastern Mima-ya and in the mountains of Indo-China. Roxburgh's *D. angustifolia* is a purely littoral Malayan tree,

548. *Dracaena spicata* Roxb.

Myitkyina (E); Namlao to Bansparao, 500 to 2,000 ft. (E); Lammuk, 2,400 ft. (E). DiSTRIB. Assam Ranges, Chittagong and Andamans | not before sent from Burma.

549- *Polygonatum cirrhifolium* Royle*

Myitkyina (C). DiSTRIB. Throughout Northern Asia.

550. *Polygonatum nervulosum* Bak.

Myitkyina (C). DiSTRIB. Sikkim; Bootan and Daphla; not before sent from Burma.

551. *Disporum pullum* Salisb., VAR. *oblanceolatum* Prain.

Lammuk, 2,400 ft. (E).

A very distinct variety ; the flowers not yet reported.

552. *Paris polyphylla* Bon.

Nawgo Kha, 1,300 to 2,000 ft, (E); Myitkyina (C). DiSTRIB. Himalaya; Assam Ranges ; W. China; Burma.

A Garlic which the Chinese interpreter, and following his example, the other members of Lieutenant Pottluger's party were used as a vegetable during the marches subsequent to the attack on Atwasma (see on p. 10) occurs in considerable quantity on high mountain ranges at the head waters of the Lakhing Kha.]

XCII.—PONTEDERIACEAE.

553. *Monochoria vaginalis* Presl.

Myitkyina (C). DiSTRIB. Throughout the Tropics of the Eastern Hemisphere.

XCIII.—COMMELINACEAE.

554; *Pollia Aclisia* Hassk.

Myitkyina (C). DiSTRIB. Eastern Himalaya; Assam Ranges; Indo-China, Malaya.

555. *Commelina bengalensis* Linn.

Myitkyina (0). DISTRIB. Tropics of Old World.

556. *Commelina obliqua* Don.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

557. *Commelina salicifolia* Roxb.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya |
not in the Himalayas.

China;

558. *Aneilema lineolatum* Kunth.

Myitkyina (C), DISTRIB. India; Indo-China; Malaya.

559. *Aneilema scaberrimum* Kunth.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

560. *Aneilema triquetrum* Wall.

Myitkyina (C). DISTRIB. Assam Ranges; China; not
collected in Burma.

before

561. *Streptolirion volubile* Edgew.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; China;
previously collected by Griffith during his Hukung Valley jour

afso
dey.

562. *Streptolirion volubile* Edgew. VAR. *setosa* Prain.

Myitkyina (C).

An extremely distinct variety.

563. *Floscopa scandens* Lour.

Myitkyina (C). DISTRIB. Throughout South-Eastern As
in Australia.

ra and

XCIV.—PALMES.

564. *Pinanga gracilis* Bl.

Patzam, 1,100 ft. (C). DISTRIB. Eastern Himalaya;
Ranges; Burma.

Assam

565. *Wallichia disticha* T, And.

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. Himalaya; W
|*Caryota obtusa* Griff. ?-The "Seit" described in
ductory chapter is a *Caryota* and apparently is this specif
events Lieutenant Pottinger does not recognise it either in
or in *C. mitis* though very like the former of these t
somewhat different leaves. No examples were brought. The
locality for *C. obtusa* is the not far distant Mishmi country.

R rina,

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566. *Phoenix humilis* Roxb., VAR. *Loureirii* Becc*

Myitkyina (E). DISTRIB. Assam Ranges and Indo-China.

567. *Plectocomia assamica* Griff.

Bansparao, 2,000 ft. (E). DISTRIB. Assam

This species is very common in the lower hills.

[The canes for bridges on the rivers are obtained
one or more species of *Calamus*, of which no specimens were

locally from
brought.]

XCV%—**AROIDEÆ.**

568, *Arisaëia album* *N. E. Br.*

Myitkyina (C). DiSTRIB. Khasia Hills; not before sent from Burma.

569. *Arisaëma concinnum* *Schott.*

Myitkyina (C). DiSTRIB. Eastern Himalaya; not before sent from Burma.

570. *Arisaëma petiolulatum* *ffooi.f.*

Myitkyina (C). DiSTRIB. Khasia Hills and Manipur; not before sent from Burma,

571. *Typhonium cuspidatum* *Bl.*

Myitkyina (C). DiSTRIB. Lower Bengal; Burma 5 Malaya.

572. *Typhonium gracile* *Schott.*

Myitkyina (C). DiSTRIB. Assam jSilhet; also in the Punjab.

573* *Typhonium inopinatum* *Prain**

Myitkyina (C). DiSTRIB. Bengal (doubtfully wild).

574. *Typhonium Fottingeri* *Prain.*

Myitkyina (C).

Raised from tubers sent from Myitkyina and grown in the Calcutta Botanic Garden.

575- *Amorphophallus Cruddasianus* *Prain.*

Noichong to Phalé, 1,300 to 2 000 ft. (E) ; Myitkyina (C).

Very distinct because of its long parsnip-like corms, of which Samples are under cultivation in the Calcutta Garden.

576'. *Amorphophallus* sp.

Myitkyina (C).

Also being cultivated in the Calcutta Garden ; as yet only leaves have been produced, so that the species cannot be determined.

577- *Gonatanthus sarmentosus* *Klotzsch.*

Myitkyina (C) ; Namlao (E). DiSTRIB. East Himalaya ; Assam Kai*ges; not before collected in Burma.

578. *Colocasia antiquorum* *Schott**

Myitkyina (C). DiSTRIB. Cultivated in all warm countries.

This was very generally found by Lieutenant Pottinger's party in the neighbourhood of villages throughout the Kachin Hills.

579. *Alocasiaindica* *Schott.*

Namlao (E), Myitkyina (C). DiSTRIB. Cultivated in all hot coun-

tries* Almost as common as the preceding.

580. *Stuednera capitellata* *Hook.*

Nawgo Kha, 1,300 to 2,000 ft. (E) DiSTRIB. Burma. Previously collected by Dr. J. Anderson in the Taping Valley.

581. *Lasia aculeata* Lour.

Namlao (E); Bansparao, 2,000 ft. (E). DiSTRiB. India; Indo-China; Malaya.

582. *Pothos Cathcartii* Schott.

Shigu Ferry, 800 ft. (E); Pali, 1,500 ft. (E). DiSTRiB. Himalaya- > Assam Ranges, Burma.

583. *Pothos scandens* Linn.

Bansparao, 2,000 ft. (E). DiSTRiB. India; Indo-China; Mai > China.

584. *Pothos Vriesianus* Schott*

Namlao to Bansparao, 500 ft. to 2,000 ft. (E). DiSTRiB. g^{ast} Himalaya, Assam; not before sent from Burma.

[Besides the foregoing a *Raphidophora* was collect*_{ban} d^{uri}n^g the expedition, but the specimens were among the articles a when the party was attacked.]

XCVI.—ALISMACEJE.

585. *Sagittaria sagittifolia* Linn.

Myitkyina (C). DiSTRiB. Plains of Northern In<>^a, North Europe, Asia and America.

XCVII.—NAIADACE^S.

586. *Aponogeton crispus* Tkunbg.

Myitkyina (Cj. DiSTRiB. Inaia; Indo-China; Australia.

587. *Potamogeton perpusillus* Zl<<<.

Myitkyina (C). DiSTRiB. Temperate and sub-tropical reg^{ou}Si

XCVIII.—CYPERACE^.

588. *Lipocarpa argentea* R. Br.

Myitkyina (C). Tropical and sub-tropical regions of t^h c Eastern Hemisphere.

589. *Bulbostylis capillaris* Kunth. VAR. *trifida* Clark** e Eastern

Namlao (E). DiSTRiB. (of variety.) Warmer regions of tn Hemisphere.

590. *Carex baccans* Nees.

Neochawng, 700 ft. (E). DiSTRiB. India; E. Himalaya; Ass^{ar}Ti Ranges; China; Malay Islands; not before collected in Burm

591. *Carex cruciata* Vahl.

Myitkyina (C). DiSTRiB. Eastern Himalaya; Assam Rang^es, Malaya; China; Madagascar; not before collected in Burma.

592. *Carex filicina* Nees.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. India ; Assam Ranges; China; Java.

593- *Carex spiculata* Nees.

Lammuk, 2,500 ft. (E). DISTRIB. E. Himalaya; Assam Ranges; not before sent from Burma.

594- *Carex stramentitia* Boott.

Namlao to Bansparao, 500 to 2,000ft. (E). DISTRIB. Bihar; Himalaya; Assam Ranges ; not before sent from Burma.

595* *Carex Thomsoni* Boott.

Myitkyina (E). DISTRIB. Himalaya ; Assam Ranges; Indo-China.

XCIX.—GRAMINEÆ.

596. *Setaria italica* Beauv.

Generally cultivated in the Kachin villages at elevations of over 3,500 ft. ; specimens from Paid (E), and elsewhere (C). DISTRIB. Cultivated in most warm countries.

[*Oryza sativa* Linn.—Generally cultivated : wet-rice cultivation takes place north of Kwit, except in the Nachawng Kha Valley, between the villages of Galing and Pelap; dry-rice is grown very generally below 3,500 ft. throughout the hills.]

597- *Coix Lachryma* Linn.

Namlao (C). DISTRIB. Wild in S. E. Asia, cultivated in Tropics generally.

The cultivation of this species as a cereal crop, which is so striking a feature in the agricultural economy of the tribes that inhabit the mountains between the Brahmaputra and the Chindwin rivers, is conspicuous by its absence from the Kachin Hills,

[*Zea Mays* Linn.—Generally grown at elevations above 3,500 ft.; the use of this grain appears to have been derived from the Chinese.]

598' *Anthistiria scandens* Roxb.

Namlao (E). DISTRIB. India ; Indo-China ; Malaya ; Mascarene Islands.

3| *Eleusine Coracana* Goertn.—Very generally cultivated above 500 ft., 1

599- *Dendrocalamus Brandisii* Kure.

Namlao, 2,000 to 2,500 feet (E). DISTRIB. Burma.

6 *Pseudostachyum polymorphum* Munro.

6 *Stachytarpheta* (C) DISTRIB. Eastern Himalaya; Assam ; Burma.

6 *Cephalostachyum Fuchsianum* Gamble.

6 *Stachytarpheta* (C). DISTRIB. Sikkim \ Bhutan ; Daphla.

An interesting eastward extension of this rather rare, species.

[In addition to the foregoing a species of *Arundinarta w** very plentiful on the mountains near the Chinese frontier crossed by Lieutenant Pottinger's party. Several other Bamboos were seen, but, not being in flower, specimens were not collected.]

CRYPTOGAMIA.

C—EQUISETACEAE.

602. *Equisetum debile Roxb.*

Namlao (E). DISTRIBUTION. South-Eastern Asia.

603. *Equisetum diffusum Don.*

Myitkyina (C). DISTRIBUTION. Himalaya; Manipur; previously collected in the Taping Valley by Dr. J. Anderson, but not hitherto sent from any other part of Burma.

CI.—LYCOPODIACEAE.

604. *Lycopodium cernuum Linn.*

Banks of the 'Nmai Kha, 900 ft. (E). DISTRIBUTION. Cosmopolitan the Tropics.

CII—SELAGINELLACEAE.

605. *Selaginella canaliculata Baker.*

Namlao (E) ; Bansparao 2,000 ft. (E) ; Myitkyina (E) is very plentiful along the upper reaches of the Nachawng Kha. DISTRIBUTION. East Himalaya; Indo-China ; China ; Malaya.

606. *Selaginella picta A. Br.*

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIBUTION. Assam Ranges; Mishmi Hills; not before sent from Burma.

607. *Selaginella Wallichii Spreng.*

Nawgo Kha, 1,300 to 2,000 feet; also plentiful in the Nachawng Kha Valley (E). DISTRIBUTION. Eastern Himalaya; China ; Malaya ; New Guinea.

CIII-FILICES.

608. *Davallia chinensis Sw.*

Myitkyina (C). DISTRIBUTION. Tropics of Old World.

609. *Davallia Griffithiana Hook.*

Lammuk, 2400 ft.(E); Kepio, 2,900 ft.(E). DISTRIBUTION. Assam Ranges; China; Burma; Malaya.

610. *Onychium auratum Kaulf.*

Myitkyina (C). DISTRIBUTION. Himalaya; Indo-China; Malaya.

611. *Pteris biaurita Wall.*

- Bansparao, 2,000 ft. (E). DiSTRiB. Cosmopolitan in the Tropics.
612. *Blechnum orientale* Linn.
Namlao to Bansparao, 500 to 2,000 ft. (E). DiSTRiB. Himalaya;
hina; Indo-China; Malaya ; Australia.
613. *Asplenium Finlaysonianum* Wall*
'Nsentaru, 600 ft. (E). DiSTRiB. Himalaya; Indo-China;
Malaya.
614. *Asplenium planicaule* Wall,
Neochawng, 7,000 ft. (E). DiSTRiB. India; Himalaya; not
before collected in Burma.
615. *Aspidium aristatum* Sw
Phalè, 1,300 to 3,300 ft. (E). DiSTRiB. Japan; China ; Himalaya;
India ; Polynesia; Australia; Natal.
616. *Nephrodium falcilobum* Hook.
Myitkyina (E). DiSTRiB. India ; Indo-China ; China ; Malaya.
617. *Nephrodium Leuzeanum* Hook,
Lammuk, 2,500 ft. (E). DiSTRiB. Himalaya ; Indo-China; China ;
Malaya ; Polynesia.
618. *Nephrodium membranifolium* Presl.
Namli, 2,000 ft. (E). DiSTRiB. India ; Indo-China ; Malaya ;
Polynesia ; Madagascar.
619. *Nephrodium variolosum* Hook, fy Bak,
Patzam, 1,100 ft. (E). DiSTRiB. India ; Indo-China ; Malaya.
620. *Polypodium leiorrhizon* Wall,
'Nsentaru, 600 ft. (E). DiSTRiB. Himalaya; Assam Ranges; not
before collected in Burma,
621. *Gymnogramme javanica* DC.
Ningting, 800 ft. (E). DiSTRiB. Tropics of Old WorJd.
622. *Antrophyum plantagineum* Kaulf.
Banspaiao, 2,000ft. (E). DiSTRiB. Ceylon ; Himalayas ; Assam ;
Indo-China ; Malaya ; Polynesia.
- ⁶²³« *Acrostichum appendiculatum* Willd.
bansparao, 2,000 ft. (E), DiSTRiB. India ; Indo-China ; China ;
Malaya.
- ⁶²⁴« *Platyserium Wallichii* Hook.
- Myitkyina (E); Bansparao, 2,000 ft. (E). DiSTRiB, Assam
Ran ges; Malaya.
- ⁶²⁵« *Lygodium pinnatifidum* Sw.
- Namlao to Bansparao, 500 to 2,000 ft. (E). DiSTRiB. Tropics of
Old World.
- [Osmunda regalis Linn.—This was very plentiful in the upper
vally of the Nachawng Kha.]

In Indo-Chinese countries lying east of the Irrawaddy Valley; though as many as 173 of the 173 plants common to the Kachin Hills and the Taping Valley occur on the Shan Plateau as well, more than one-third of these are distributed to all parts of South-Eastern Asia, and there are only four species that are peculiar to the Kachin Hills, the Taping Valley and the Shan Hills.

In strong contrast with this parsimony of Chinese and of eastern Indo-Chinese influence in the Taping Valley flora, as represented by those species that this valley shares with the Kachin Hills, stands the fact that no fewer than 16 of these 173 species are plants that are distinctive of the Eastern Himalaya, or of the Assam Ranges, or of both, and that find their eastern limit of distribution, so far as is now known, in the Taping Valley. At the same time no fewer than five species are peculiar to the Kachin Hills and the Taping Valley, so that the conjoined Kachin-Taping area, though immediately bordering on China and the Shan Plateau, exhibits an endemic element that exceeds numerically the Chinese and Shan elements respectively, and yet hardly exceeds in strength one-third the element derived from the more remote Himalo-Assamese areas. These facts render it advisable to include the Taping Valley in the natural phytogeographical area to which the Kachin Hills properly belong, and this annexation has the further advantage of according with the physiographical features of the region. The Taping Valley constitutes an integral portion of the catchment-area of the Irrawaddy, and is separated from the river-systems of China by the mountain-ranges that at once confine and separate the narrow gorges occupied by the Salween and the Mekong.

Physiographical considerations lead equally to the suggestion that the Hukung Valley may also be best conjoined with the Kachin Hills as a preliminary measure, and an examination of the distribution of our Kachin plants, where the Hukung and Taping species present in the Herbarium at Calcutta are indicated, bears out this view. There are 34 species in the list that are known to have been obtained by Griffith in the Hukung Valley, and it is possible that still another (*Eugenia Griffithii*) may have come from there. Twenty of these species, or rather more than half, extend both westward into Assam, the Himalayas or India, and eastward into China, Indo-China, Malaya, and thus throw no light on the affinities of the Hukung flora, while there is only one that does not occur elsewhere save in the countries east of the Irrawaddy basin, no fewer than nine extend only westward, and as many as four are confined to the Irrawaddy catchment-area. Of the 13 plants that are either confined to this area or

that extend only westward from it, there are four that occur in the Hukung and Taping Valleys, as well as in the central part of the Kachia country.

It seems then safe to conclude that the catchment-area of the Upper Irrawaddy admits of being dealt with as a natural geographical entity, and that the plan of considering its eastern portion as Chinese and its western as Burmese must be abandoned. The question now to be settled is the precise relationship of this Hukung-Kachin-Taping district. Situated as it is where three well-marked phytogeographical sub-areas—those of Indo-China and the Eastern Himalaya—meet, it may not conveniently be referable to any one of these, and from its position may throw light on the relationships these bear to each other. The writer has, on more than one occasion, had reason to express his belief, based on an examination of the distributional features in particular genera like *Pedicularis* and *Gotnphostemma* that the hitherto accepted sub-division of Western Indo-China into a northern half termed Ava and a southern half termed Pegu, is at variance with physiographical and phytogeographical facts, and is inconvenient as it is incorrect. The facts reviewed by him elsewhere where have led to a proposal to treat as a natural sub-sub-area a block of mountainous country that intervenes between the valleys of the Brahmaputra river to the north and west, and the day river to the east. This block certainly includes the nilgiris known as the Patkoi, Barel, Khasi, Chin-Lushai, Chittagon and in Arracan, and ends towards the south in the Andaman Islands. In this sense possesses a natural rank equivalent to that of the Gorges Himalaya from the Sarju Valley, 82°E. Lon., to the Dihong f 95°E. Lon. The Mishmi-Kachin block, between the gorges of Dihong and the Sahven, 95°E. Lon. to 99°E. Lon., may be referable to either one or other of the sub-sub-areas but it may equally conceivably be regarded either as central Chinese—the tract of mountainous country intervening between the valleys of the Irrawaddy and the Mekong—or as south-western. The unexplored character of the block in question has rendered any opinion on the point more or less conjectural. In order to test the extent to which our present Kachin collection of its itself to the elucidation of this point, the distributional features of each element have been tabulated so as to show the extension of the species westward into the Assam-Arracan sub-sub-area, and into the sub-sub-area of the Eastern Himalaya, beyond these into India.

• M M a,.. »a u. ' ft— Indo-China, beyond Indo-China into the Malay countries. . wihntion are shown is followed by

The list in which the facts of disteibut^{on} from various influences may be readi^{ng} the synoptic table, the re, for the sake Ql^{ity}, used 5n pt^{ace}, ern Indo-China" and

re\te S_m a_p) to show the geos^{hip of the Kachin} Hills to adjacent areas has been added 1 * based on Stieler's Hand-Atlas, maps No. 66 and No. 67; the ranch, is in maps were shown as not rising - J' ^ . ' J - is now known not to be the case. Ushed it was supposed to do so,

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	i IS	Malaya.
—	x	x	—	<i>Thalictrum foliolosum</i>	—	—	—	—
x	x	x	—	<i>Anemone rivularis</i>	x	—	x	—
—	x	x	—	<i>Clematis acuminata</i>	x	—	x	—
—	—	—	—	<i>Dillenia pulcherrima</i>	—	—	x	—
—	—	x	—	<i>Unona dumosa</i>	—	—*	—	x
—	—	—	—	<i>Goniothalamus peduncularis</i>	—	—	—	—
—	x	x	—	<i>Miliusa macrocarpa</i>	—	—	—	—
—	x	x	—	<i>Parabxna sagittata</i>	x	—	x	—
x	—	x	—	<i>Pericampylus in can us</i>	x	x	x	x
—	^	—	—	Cyclea sp.	x	—	—	—
—	—	x	—	<i>Brassica juncea</i> VAR. <i>agrestis</i>	x	x	—	x
x	x	x	—	<i>Gynandropsis leptophylla</i>	x	x	—	—
—	—	x	—	<i>Capparis sabisfolia</i>	—	—	—	—
x	—	x	x	<i>Capparis tenera</i>	—	—	x	—
—	—	—	x	<i>Roydsia parviflora</i>	—	—	—	—
—	—	x	—	<i>Cratava lophosperma</i>	—	—	—	x
—	x	x	—	<i>Salomonina cantoniensis</i>	—	x	x	—
x	x	x	—	<i>Polygala arillata</i>	—	x	x	—
x	x	x	—	<i>Polygala leptalea</i>	—	—	x	x
—	—	x	—	<i>Securidaca tavoyana</i>	—	x	x	x
—	—	x	—	<i>Xanthophyllum glaucum</i>	—	—	x	x
x	x	x	—	<i>Stellaria media</i>	—	x	x	—
—	x	x	—	<i>Hypericum patulum</i>	x	x	—	—
—	—	x	—	<i>Garcinia lanceaefolia</i>	—	—	—	—
—	—	x	x	<i>Saurauja macrotricha</i>	x	—	—	—
—	x	x	—	<i>Saurauja Roxburghii</i>	—	—	x	—
—	—	x	—	<i>Camellia Thea</i>	—	?	?	—
—	—	x	—	<i>Anneslea fragrans</i>	—	—	x	—
—	x	x	x	<i>Eurya acuminata</i> VAR. <i>euprista</i>	x	—	x	x
—	—	—	—	<i>Shorea siamensis</i>	—	—	x	—

India.	Himalaya.	Arracan.	Hukung Valley.	Name of Species.	Taping Valley.	China.	China.	Malaya.
X	X	X	X	Kydia calycina	X	X	X	X
v	X	X	—	Abutilon indicum	—	X	X	X
X	X	X	—	Urena lobata	X	X	X	X
—	X	y	—	Hibiscus cancellatus	X	—	X	—
—	—	x	—	Hibiscus macrophyllus	—	—	X	X
X	X	X	—	Theophrastia lamifolia	X	—	X	X
X	X	X	—	Botanix malabaricum	—	X	X	X
.	X	X	—	Sterculia coccinea	X	—	X	—
!	—	—	—	Sterculia cognata	—	—	—	—
X	X	X	—	Sterculia colorata	—	—	X	—
!	X	X	X	Helicteres glabriuscula	X	—	X	—
X	—	—	—	Helicteres isora	—	—	—	X
—	—	X	—	Buettneria pilosa	X	—	X	—
!	X	X	—	Grewia elastica	—	—	X	—
X	—	—	—	Grewia hirsuta	—	X	—	—
!	X	X	—	Grewia sapida	—	—	—	—
X	X	X	X	Triumfetta pilosa	X	X	X	X
:	—	X	—	Elaeocarpus braceanus	—	—	—	—
X	X	X	—	Reinwardtia trigyna	—	X	X	X
!	—	X	—	Hiptagea candicans	—	—	X	—
!	—	X	—	Impatiens bella	—	—	—	—
!	?	?	—	Impatiens latiflora	X	—	—	—
!	X	X	—	Impatiens leptoceras	—	—	—	—
!	X	X	—	Impatiens puberula	—	—	—	—
!	X	X	—	Clausena excavata	X	—	X	X
!	X	X	—	Micromelum pubescens	X	—	X	X
X:	X	X	X	Toddalia aculeata	—	X	X	X
!	X	X	—	Zanthoxylum acanthopodium	—	—	—	—
Xc	X	X	—	Zanthoxylum ovalifolium	—	—	—	—
y	X	X	—	Acronychia laurifolia	—	X	X	X

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E.	Malaya.
x	x	x	—	Citrus medica	x	x	x	—
—	x	x	—	Brucea mollis	x	—	x	—
x	x	x	—	<i>Garuga pinnata</i>	x	—	x	x
x	—	x	—	<i>Protium serratum</i>	—	—	x	—
—	—	?	—	<i>Dysoxylum grande</i> ?	—	—	—	—
—	x	—	—	<i>Lansium decandrum</i>	—	—	—	—
x	x	x	—	<i>Cedrela Toona</i>	—	—	x	—
—	x	x	—	<i>Olax acuminata</i>	x	—	—	—
—	x	x	—	<i>Scbcepfia fragrans</i>	—	—	—	x
—	—	x	—	<i>Cardiopteris lobata</i>	x	—	—	x
x	x	x	—	<i>Celastrus pankulatus</i>	—	—	—	—
—	x	x	—	<i>Microtropis discolor</i>	—	—	—	—
—	—	—	—	<i>Gymnosporia pallida</i>	—	—	—	—
x	x	x	x	<i>Zizyphus rugosa</i>	x	—	—	—
—	—	—	—	<i>Zizyphus</i> ? sp.	x	—	—	—
—	x	x	x	<i>Rhamnus nipalensis</i>	—	—	—	—
—	—	x	—	<i>Vitis aagustifolia</i>	—	—	—	x
x	x	x	—	<i>Vitis lanceolaria</i>	—	—	—	—
—	x	x	—	<i>Vitis oxyphylla</i>	—	—	—	x
?	x	x	—	<i>Vitis repens</i>	—	x	x	x
y	x	x	—	<i>Allophylus Cobbe</i> VAR. <i>glabra</i>	—	x	x	—
—	—	—	—	<i>Lepisanthes burmannica</i>	—	—	—	—
x	x	x	—	<i>Meliosma simplicifolia</i>	—	—	—	—
—	—	—	—	<i>Taeniochlaena birmamca</i>	—	—	—	x
x	x	x	—	<i>Crotalaria alata</i>	—	—	—	—
—	x	x	—	<i>Crotalaria ferruginea</i>	—	x	—	—
—	x	x	—	<i>Indigofera atropurpurea</i> VAR. <i>nigrescens</i>	—	—	x	—
—	x	x	—	<i>Millettia pachycarpa</i>	—	—	x	—
—	—	—	—	<i>Millettia puerarioides</i>	x	—	x	—
—	—	x	—	<i>Millettia pulchra</i>	x	—	—	—

No.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
-	-	-	-	<i>Wistaria chinensis</i>	-	x	-	-
x	x	x	-	<i>Oesmodium cephalotes</i>	-	x	x	x
x	x	x	-	<i>Desmodium gangeticum</i>	-	x	x	x
!	x	x	-	<i>Oesmodium gyroides</i>	x	x	x	x
x	x	x	-	<i>Oesmodium latifolium</i>	x	x	x	x
x	x	x	-	<i>Desmodium laxiflorum</i>	x	x	x	x
-	-	-	-	<i>Desmodium oblongum</i>	-	-	x	-
!	x	x	-	<i>Desmodium oxyphyllum</i>	-	x	-	-
x	x	x	-	<i>Desmodium parvifolium</i>	-	x	x	x
x	x	x	-	<i>Desmodium polycarpum</i>	x	x	x	x
!	!	x	-	<i>Oesmodium pseudo-triquetrum</i>	-	-	-	-
x	x	x	x	<i>Desmodium pulchellum</i>	x	x	x	x
x	-	x	-	<i>Desmodium Scalpe</i>	-	-	-	x
?	x	-	-	<i>Desmodium liliaefolium 1</i>	-	-	-	-
x	-	x	-	<i>Desmodium triquetrum</i>	x	x	x	x
r	?	x	-	<i>Uraria crinita</i>	x	x	x	x
x	x	x	-	<i>Uraria hamosa</i>	-	x	x	x
!	!	x	!	<i>Uraria lagopoides</i>	!	x	x	x
x	x	x	!	<i>Uraria picta</i>	x	x	x	x
!	x	x	-	<i>Abius pulchellus</i>	-	-	x	x
!	-	-	-	<i>Lcspedeza parviflora</i>	-	x	x	-
!	!	-	-	<i>Erythrina stricta</i>	-	-	x	-
!	x	x	-	<i>Shutteria vestita</i>	-	x	x	x
!	x	x	-	<i>Mucuna macrocarpa</i>	+	-	x	-
!	-	-	-	<i>Spatholobus Pottingeri</i>	-	-	-	-
!	?	-	-	<i>Cruddasia insignis</i>	-	-	-	-
!	!	-	-	<i>Pueraria belka</i>	-	-	-	-
!	-	x	-	<i>Pueraria Candollei</i>	-	-	x	-
!	x	x	-	<i>Pueraria phaseoloides VAR javanica</i>	-	-	-	x
!	x	x	!	<i>Pueraria subspicata.</i>	!	!	+	!

India.	Himalaya.	Arracan-Assam.	Hulcung Vsilley.	Name of Species.	Taping VaHev.	China.	B. I. G. o-Chih a.	M. J. S.
—	x	x		<i>Pueraria Thunbergiana</i> . . . *	—	y	—	x
x	x	x	—	<i>Canavalia ensiformis</i> V|R viusa	—	x	x	x
x	x	x		<i>Phaseolus calcaratus</i> . . .	—	—	y	—
x	x	x		<i>Vigna pilosa</i> . . .	—	—	x	x
x	x	x	—	<i>Dohchos Lablab</i> . . .	x	x	x	x
—	—	—	—	<i>Dunbaria fusca</i> . . .	—	—	x	—
x	>	x	—	<i>Flemingia congesta</i> . . .	x	x	x	x
x	x	x	—	<i>Flemingia semialata</i> . . .	—	—	—	—
—	—	—	—	<i>Dalbergia Kingiana</i> . . .	—	—	—	—
	x	A	—	<i>Dalbergia rimosa</i> . . .	—	—	—	—
:	x	x	—	<i>Dalbergia stipulacea</i> . . .	—	—	x	—
—	—	—	—	<i>Derris latifolia</i> . . .	—	—	—	—
x	x	x	—	<i>Mezoneuron cucullatum</i> . . .	—	—	x	*
x	x	x	—	<i>Cassia Fistula</i> . . .	—	—	x	x
—	?	x	—	<i>Cassia nodosa</i> . . .	—	—	y	—
—	—	—	—	<i>t'auhinia Pottingeri</i> . . .	—	—	—	—
x	x	x	—	<i>Bauhinia variegata</i> . . .	x	y	y	—
—	x	x	—	<i>Calliandra umbrosa.</i> . . .	—	—	—	x
x	x	x	—	<i>Acacia ptnnata</i> . . .	—	—	x	—
—	—	x	x	<i>Acacia pruinescens</i> . . .	x	—	—	—
—	x	x	—	<i>Albizzsa lucida</i> . . .	x	—	x	K
—	4	x	—	<i>Pithecolobium angulatum</i> . . .	—	—	—	—
x	x	x	—	<i>Pithecolobium bigeminum</i> . . .	—	—	—	—
—	x	x	—	<i>Prunus acuminata</i> . . .	—	—	—	—
—	x	x	—	<i>Prunus persica</i> . . .	x	x	x	—
—	x	x	—	<i>runus Puddum</i> . . .	x	—	x	K
—	x	x	—	<i>Neillia thyriflora</i> . . .	—	—	—	^^
—	x	x	—	<i>Rubus hexagynus</i> . . .	x	—	x	%
x	x	x	—	<i>Potentilla Kleiniana.</i> . . .	x	x	+	?
—	x	x	—	<i>Agrimonia Eu pa tori urn</i> . . .	x	x	x	—

THE FLOTA OF THE KACHIN HILLS NORTH-EAST OF MYITKYINA. 291

India.	Ximé VB.	Arracan-Af	ukig Valley.	Name of Species.	Taping Valley.	China.	Hi In Utsiina.	Malaya.
X	X	X	-	Rosa involucrata	X	-	X	-
-	-	X	-	Photinia Notoniana VAR macrophylla	-	-	-	-
-	X	-	-	Hydrangea robusta VAR Griffithii	+	-	-	-
-	-	-	-	Hydrangea Pottingeri	-	-	-	-
-	X	X	-	Dfchroa febrifuga	-	X	X	X
-	-	-	-	Escailoniearum <i>gen. nov.</i>	-	-	-	-
-	X	X	-	Itea macrophylla	-	-	-	X
-	X	X	-	Altingla excelsa	+	-	-	X
-	-	-	-	Tercninalia a'gyrophylla	-	-	-	-
X	X	X	-	Termlnalia Chebula	-	-	X	X
X	X	X	-	Termioalia myriocarpa	X	-	X	-
X	-	X	-	Calycopteris floribunda	-	-	X	X
-	-	-	-	Eugenia daviflora	-	-	X	X
-	-	X	P	Eugenia Griffith!	-	-	-	?
X	X	X	-	Eugenia obovata	-	-	X	-
X	X	X	-	Osbeckia chinen?is	X	X	X	X
X	X	X	-	Melastoma nralabathricum	-	-	-	-
-	A	X	-	Melastoma normale	X	-	X	-
-	X	X	-	Oxyspora paniculata	-	-	-	-
-	X	X	-	Sonerila maculata	-	-	X	-
-	X	X	-	Woodfordia floribunda	X	X	X	-
-	X	X	X	Lagerstrcemia parviflora VAR. ben* galensis	-	-	-	-
-	X	X	-	Punica Granatum	X	X	X	X
-	X	X	-	Casearia graveoiens	-	X	-	-
-	X	X	-	Hodgsonia heteroclita	-	-	X	-
-	X	X	-	Trichosanthes palma^a	X	-	X	X
-	X	X	-	Prichosanthes Wallichiana	X	X	X	X
-	X	X	-	ijymnopetalum cochinchinense	-	X	X	X
-	-	-	-	Alsomitra pabigera	-	-	-	-

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China	E. Indo-C	I.
—	—	x	—	Thladiantha Hookeri	—	—	—	—
—	x	x	—	Begonia barbata	—	—	x	—
—	x	x	—	Begonia gigantea	—	—	—	x
x	x	x	—	Hydrocotyle javanica	—	x	x	—
—	x	—	—	Heracleum Wallichii	—	—	—	x
—	x	x	—	Aralia armata	—	—	x	—
—	—	—	—	Heptapleurum Lawranceanum	—	—	—	—
—	x	x	—	Marlea begoniaefolia	—	x	—	—
—	—	—	—	Mastixia euonymoides *	—	—	—	—
—	—	—	—	Alangium Kingianum	—	—	—	x
—	—	x	—	Satnucus javanica	x	x	x	x
—	x	x	—	Viburnum coriaceum	x	x	x	?
—	—	x	—	Lonicera japonica	—	x	—	—
—	—	x	—	Adina sessilifolia	—	—	—	—
—	x	x	—	Uncaria macrophylla	—	—	x	—
—	x	x	—	Uncaria sessilifrutus	x	—	x	—
—	x	—	—	Luculia gratissima	—	—	x	x
—	—	x	—	Wendlandia paniculata	x	x	x	?
—	x	x	x	Wendlandia tinctoria	—	—	x	x
—	—	x	—	Hedyotis capftellata	x	—	x	x
x	x	x	—	Hedyotis hispida	x	x	x	—
—	x	x	—	Hedyotis scandens	x	—	—	—
—	x	x	—	Anotis ingrata	—	—	—	—
—	—	x	—	Spiradiclis cylindrica	—	—	—	?
x	—	x	—	OphiorrhizaHarrisiana VAR.argentea	—	—	—	—
—	—	x	—	Ophiorrhiza hispida	—	—	—	?
mm	—	—	—	Ophiorrhiza Lawranceana	—	—	—	—
—	x	x	—	Barlemannia GrifGthii	—	—	—	—
—	x	x	—	Mussaenda Roxburghii	—	—	—	—
—	—	—	—	Mussaendasp.	—	—	—	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	緬甸 Cd	Malaya.
	x	x	x	Randja Wallichii	x	—	x	x
	—	—	—	Gardenia erythroclada	—	—	x	—
	—	x	—	Coffea Jenkinsii	—	—	—	—
	x	x	—	Morinda angustifolia	x	—	x	—
	—	x	—	Psychotria adenophylla	—	—	x	—
	x	x	—	Psychotria calocarpa	x	—	x	—
	x	x	—	Psychotria erratica	—	—	—	—
x	x	x	—	Chasalia curviflora	—	—	x	x
	—	x	—	Lasianthus Wallichii	—	x	x	—
	—	—	—	Paederia Cruddasiana	—	—	—	—
x	—	x	—	Vernonia arborea	—	—	x	x
x	x	x	—	Vernonia cinerea	x	x	x	x
	x	x	—	Vernonia scandens	—	—	x	—
	x	x	—	Veroomia volkamerisefolia	x	—	x	—
x	x	x	—	Adenostemma viscosum VAR. elata	x	x	x	x
x	x	x	—	Dichrocephala latifolia	x	x	x	x
	x	x	—	Blumea balsamifera	x	x	x	x
	x	x	—	Blumea chinensis	—	x	x	x
	x	x	—	Blumea myriocephala	x	x	x	—
x	x	x	—	Laggeraflava	x	x	x	x
x	x	x	—	Gnaphalium indicum	x	x	x	—
x	x	—	—	Vicoaauriculata	x	—	x	—
mm	—	x	—	Cotula hemisphaerica	x	x	x	—
x	x	x	—	Spilanthes Acemella VAR. calva	x	—	x	—
	x	x	—	Artemisia vulgaris	x	x	x	x
	x	x	—	Emilia prenanthoidea	x	—	—	—
	x	x	—	Senecio araneosus	—	—	—	x
mm	—	x	mm	Senecio yunnanensis	x	—	—	—
mm	x	x	—	Pratia begoniifolia	—	x	x	x
	x	x	—	Lobelia affinis	—	x	x	x

2Q4 THE BOTANY OF 1HB KACHIN HILLS NORTH-EAST OF MYITKYIN^{A.}

India.	Xinaiay.	A	Hukung Valley.	Name of Specios.	Taping Valley.	China.	Esia S ^c S ^a	
—	x	x	—	Lobelia rosea	x	—	x	|
x	x	x	—	Wahlenbergia gracilis	—	x	x	|
—	x	x	—	Campanumcea parviflora	—	—	x	|
—	—	—	—	Agapetes Po'tingeri . . . . .	—	—	—	|
—	—	x	—	Desmogyne neriifolia . . . . .	—	—	—	|
—	y	x	—	Peris ovalifolia	x	x	x	|
—	—	—	—	Rhododendron indicum	x	x	—	|
—	—	—	—	Lysimachia evalvis VAR. latifolia . . . . .	—	—	—	|
—	x	x	x	Lysimachia ramosa . . . . .	—	—	—	|
—	—	—	—	Ardisia crenata	—	x	x	|
—	—	x	—	Ardisia virens	x	—	—	|
—	—	—	x	Pimelandra Griffithii . . . . .	—	—	—	|
—	x	x	x	Sarcosperma arboreum . . . . .	—	—	—	|
—	x	x	—	Symplocos racemosa	—	x	x	|
—	x	x	—	Jasminum anastomosans	—	—	x	|
—	—	—	—	Jasminum decussatum . . . . .	—	—	—	|
—	x	x	—	Jasminum scandens . . . . .	—	—	—	|
—	—	—	—	Rauwolfia chinensis	—	x	—	|
x	x	x	—	Alstonia scholaris	—	—	x	|
x	x	x	—	fabernccmontana coronaria	x	x	x	|
x	x	x	—	Holarrhena antidysenterica	—	—	x	|
x	x	x	—	Vallisneria Heynei	x	—	x	|
—	—	—	—	Pottsia cantoniensis	—	x	—	|
—	—	x	—	Aganosma cymosum . . . . .	—	—	—	|
—	x	x	—	Periploca calophylla	—	x	—	|
—	—	x	—	Styriopterum paniculatum	—	—	x	|
x	x	x	—	Asclepias Curassavica	x	x	x	|
—	x	x	—	Cynanchum corymbosum	x	—	x	|
—	—	x	x	Centasacme candatum	—	—	x	|
—	x	x	—	Hoya longifolia . . . . .	—	—	—	|

India.	Himalaya.	Arracan-Asia E.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya,
—	—	X	—	Hoya parasitica	—	—	X	X
—	X	X	—	Ceropegia pubescens	—	—	—	—
—	—	X	X	Gelsemium elegans	X	X	—	X
X	X	X	—	Buddleia asiatica	X	X	X	X
—	X	X	—	Exacum teres	—	—	—	—
X	X	X	—	Exacum tetragonum	—	X	—	—
—	X	X	—	Cynoglossum micranthum	—	X	X	—
—	X	X	—	Ipomoea linifolia	—	—	X	X
X	X	X	X	Ipomoea viti folia	X	—	X	X
X	X	X	—	Evolvulus alsinoides	—	X	X	X
X	X	X	—	Porana paniculata	X	—	X	X
*	X	X	—	Porana racemosa	—	X	X	—
—	—	X	X	Solanum barbisetum VAR. Giffithii .	X	—	—	—
—	—	—	—	Solanum biflorum	X	X	X	X
—	—	—	—	Solanum ferox VAR. fnermis	—	—	—	—
X	X	X	—	Nicotiana Tabacum	X	X	X	X
X	X	X	—	Torenia edentula	—	X	X	X
—	—	X	—	Toreniaflava. . . .	—	X	X	X
—	X	X	X	Torenia rubens	—	—	—	—
—	X	X	—	Torenia vagans	—	X	—	—
X	X	X	—	Vandellia scabra	—	X	X	X
X	X	X	—	Vaodellia sessili flora »	—	—	X	—
X	*	X	—	Bonnaya reptans	X	X	X	X
X	X	X	—	Bonnaya veronicaefolia	X	X	X	X
X	X	X	—	Centranthera hispida	—	X	X	X
X	X	X	—	Aeginetia indica	—	X	X	X
X	X	X	—	Utricularia orbiculata	—	X	X	X
—	—	—	—	Eschynanthus grandiflora VAR. longiflora.	—	—	—	—
—	—	X	—	Eschynanthus brevipes	—	—	—	—

India.	Ximalaya.	Assam.	Himalay.	Name of Species.	Tan. Vjley.	China.	Chi o.	Malaya.
|	x	|	|	iCschynanthus maculata . . .	|	|	|	|
|	|	|	|	(Eschynanthus micrantha VAR. Pot'fingeri.	|	|	|	|
|	|	|	|	^schooathus pusilla . . .	|	|	|	|
|	|	x	|	iEschynanthus Superba . . .	|	|	|	|
|	x	x	|	Rhynchotechum ellipticum . . .	|	|	|	|
|	|	x	|	Rhynchotechum ellipticum VAR. angusta.	|	|	|	|
|	x	x	|	Rhynchotechum vestitum . . .	|	|	|	|
x	x	x	|	Rhynchoglossum obliquum VAR. parviflora.	|	x	|	|
|	|	|	|	Stauranthera grandi flora . . .	|	|	|	|
|	|	|	|	Didymocarpus elatior . . .	|	|	|	|
|	x	x	|	Chirita puihila . . .	|	|	|	|
|	|	|	|	Chirita speciosa . . .	|	|	|	|
|	|	x	|	Mayodendron igneum . . .	x	|	|	|
x	x	x	|	Sesamum indicum . . .	x	x	|	|
|	x	x	|	Thunbergia coccinea . . .	|	|	|	|
|	x	|	|	Thunbergia lutea . . .	|	|	|	|
|	x	x	|	Thunbergia grandiflora . . .	x	|	|	|
x	x	x	|	Nelsonia campestris . . .	x	|	x	|
|	|	x	|	Hygrophila salicifolia . . .	|	x	|	|
|	|	|	|	Daedalacanthus tetragonus . . .	x	|	x	|
|	x	x	|	Strobilanthes capitatus . . .	|	|	x	|
|	x	x	|	Strobilanthes coloratus . . .	|	|	|	|
|	x	M	|	Strobilanthes pentstemonoides . . .	x	x	|	|
|	|	x	x	Acanthus leucostachyus . . .	x	|	|	|
|	|	x	|	Asystasia Neesiana . . .	|	|	|	|
|	x	x	|	Eianthemum indicum . . .	|	|	|	|
|	|	x	|	Eranthemum palatiferum . . .	x	x	x	|
|	|	|	|	Eranthemum palatiferum VAR. elata	|	|	|	|

	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
	—	x	—	Codonacanthus pauciflorus	—	x	^^	—
	—	x	—	Andrographis tenuiflora	—	—	x	—
	—	x	—	Phlogacanthus curviflorus	—	—	x	—
	—	x	—	Phlogacanthus Jenkinsii	x	—	—	—
	x	x	—	Phlogacanthus pubinervius	—	—	x	—
	x	x	—	Phlogacanthus tubiflorus	—	—	—	—
x	x	x	—	Lepidagathis hyalina	—	x	x	—
x	x	x	—	Justicia procumbens VAR. latispica	—	x	x	x
x	x	x	—	Adhatoda Vasica	x	x	x	x
	—	—	—	Rhinacanthus calcaratus VAR. maxima	—	—	—	—
	—	x	—	Rungia stolonifera	—	—	—	—
x	x	x	—	Dicliptera Roxburghiana	—	—	x	—
	x	x	—	Callicarpa arborea	x	—	x	x
	x	x	—	Caryopteris paniculata	x	—	—	—
x	x	x	—	Piemna herbacea	x	—	x	—
	—	x	—	Premna milleflora	—	—	—	—
x	x	x	—	Gmelina arborea	—	—	x	x
*^	—	x	—	Vitex glabrata	—	—	x	x
**	x	x	—	Clerodendron C olebrookean urn.	x	—	x	x
	—	—	x	Clerodendron Griffithianum	x	—	—	—
	x	x	—	Clerodendron infortunatum	x	—	x	x
	—	x	—	Clerodendron lasiocephalum	x	—	—	—
	x	x	—	Clerodendron nutans	x	—	—	—
	x	x	—	Clerodendron serra turn	x	—	x	—
	—	x	—	Sphenodesma pentandrum	—	x	x	x
	—	x	—	Congea tomentosa	—	—	x	—
	x	x	—	Geniosporum strobiliferum	—	—	x	—
	x	x	—	Acrocephalus capitatus	—	—	x	x
	x	x	—	Orthosiphon stamineus	x	x	x	x
	x	x	—	Plectraothus Coetsa	mat	—	x	—

India.	Himalaya.	Arracan-Abs. S.	Hukung Valley.	Name of Species.	Taping Valley.	China.	S. S. Ch.	I
—	—	X	—	Pictranthus hispidus	—	X	X	—
X	X	X	—	Plectraothus ternifolius	X	X	X	—
X	X	X	—	Dysophylla Auricularia	—	X	X	—
X	X	X	—	Colebrookia oppositifolia	X	—	X	—
—	X	X	—	Perilla ocimoides	—	X	X	—
—	—	X	X	Scutellaria glandulosa	—	—	X	—
—	X	Y	—	Achyrospermum Wallichianum	—	—	—	—
—	X	X	—	Notochste hamosa	—	—	X	—
—	X	—	—	Leucas hyssopifolia	—	—	X	—
X	X	X	—	Leucas mollissima	—	X	X	—
—	—	X	—	Gomphostemma lucidum	X	—	—	—
—	—	X	—	Gomphoatemma nutans	—	—	—	—
—	—	X	—	Gomphostemma parviflorum VAR. fannosa.	—	—	—	—
—	X	X	—	Leucosceptrum canum	X	—	—	—
—	X	X	—	Teucrium stoloniferum	X	X	X	—
X	X	X	—	Aiuga macrosperma VAR. breviflora	—	—	X	—
X	X	X	—	Plantago major	X	X	X	—
X	X	X	—	Deeringia celosoides	X	X	X	—
X	X	X	—	Amarantus paniculatus	—	X	X	—
X	X	X	—	Aerua scandens	X	X	X	—
X	X	X	—	Gomphrena globosa	X	X	X	—
X	X	X	—	Polygonum alatum	X	X	X	—
X	X	X	—	Polygonum chinense	X	X	X	—
—	X	X	—	Polygonum runcinatum	—	X	—	—
—	X	X	—	Polygonum viscosum	—	X	—	—
—	X	X	—	Fagopyrum cymosum	X	X	—	—
—	X	X	—	Piper boehmerisefolium	—	—	X	—
—	—	—	—	Piper Kingianum	X	—	—	—
X	—	X	—	Chloranthus brachystachyus	—	X	X	—
—	X	X	—	Actinodaphne sikkimensis	—	—	—	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
/	X	X	-	Phoebe attenuata	-	-	^	-
X	-	-	-	Phoebe paniculata	-	-	X	-
X	X	X	-	Litssea polyantha	-	X	X	X
.	X	X	.	Litsaea salicifolia VAR. ellipsoidea .	-	-	-	.
X	X	X	-	Litsaea sebifera	-	X	X	X
-	-	X	-	Lindera assamica	X	-	-	-
/	-	-	-	Daphne pendula	-	-	X	X
-	X	X	X	Wikstrcemia canescens	-	X	X	-
.	y	X	-	Loranthus involucratus	-	-	-	-
/	X	X	-	Loranthus pentapetalus	X	X	X	X
/	-	-	-	Briedelia pubescens VAR. glabra .	X	-	-	-
K	X	X	-	Sauropus albicans . 1	-	X	X	X
/	X	X	X	Glochidion assamicum	-	-	-	-
/	-	-	X	Glochidion villicaule	-	-	-	X
X	X	X	-	Flueggea microcarpa	-	X	X	X
/	-	X	-	Aporosa oblonga	-	-	X	-
/	X	X	-	Aporosa Roxburghii	-	-	X	-
/	X	X	/	Daphniphyllum himalayense	/	/	X	/
X	X	X	X	Antidesma Ghaesembhi Ha	/	X	X	X
X	/	X	/	Croton oblongifolius	X	/	X	/
/	.	.	-	Acalypha sp.	-	-	-	-
/	X	X	-	Mallotus albus	-	-	-	-
/	X	X	-	Mai lotus nepaleosis	-	-	-	-
/	X	X	-	Macaranga denticulata	-	-	X	X
X	X	X	-	Homonoia riparia	X	X	X	X
/	-	X	-	Baliospermum micranthum	-	-	-	-
X	X	X	/	Acinus communis	X	X	X	X
X	X	X	/	Delonium multiflorum	X	X	X	X
X	X	X	X	Fraxinaria reticulata	-	X	X	X
X	X	X	-	Cannabis sativa	X	X	X	v

No.	mi mgōyō.	Al to sam.	u n ley.	Name of Species.	Taping Valley.	China.	E. Indo-China	Malaya.
x	|	|	x	Streblus asper	x	x	x	x
|	x	x	|	Ficus davata «	x	|	x	|
|	|	x	|	Ficus davata VAR. trachycarpa . . . . .	|	|	|	|
|	x	x	|	Ficus hirta . . . . .	|	x	x	x
|	x	x	|	Ficus hirta VAR. Roxburghii . . . . .	|	x	x	x
|	x	x	|	Ficus mysorensis VAR. subrepanda . . . . .	|	|	x	|
|	x	x	|	Ficus obscura . . . . . »	|	|	x	x
|	x	x	|	Ficus obtusifolia	x	|	x	|
|	|	x	x	Cudrama fiuticosa . . . . .	|	|	x	|
|	x	x	|	Conocephalui suaveolens	x	|	x	|
|	x	x	|	Pilea bracteosa . . . . .	|	|	|	|
|	x	x	|	Boehraeria macrophylla	x	|	|	|
x	x	x	|	Boehmeria ^)lotyphylla . . . . .	|	x	x	|
|	|	x	|	Eoehmeria platyphylla VAR. scabrella . . . . .	|	|	|	|
x	x	x	|	Elatosteroa papillofum . . . . .	|	|	|	|
x	x	x	|	Elatostema platyphyllum . . . . .	|	|	|	|
|	|	x	|	Elatostema rupestre . . . . .	|	|	x	|
|	|	x	|	Maoutia Puya	x	|	x	|
|	x	x	|	EogelKardtia spicafa	x	|	x	|
|	x	x	|	Castanopsis tribuloides . . . . .	|	|	x	|
|	x	x	|	Alousn«paleosis	x	|	|	|
|	x	x	|	Bet u la alnoides . . . . .	|	|	x	|
x	x	x	|	Salix tetrasperma . . . . .	|	|	x	|
|	|	x	|	Gnetum Gnemon . . . . .	|	|	|	x
|	|	x	|	Mirrostylis biaurita . . . . .	|	|	|	|
x	x	x	|	Oberonia iridifolia . . . . .	|	|	x	|
x	x	x	x	Liparis longipes . . . . .	|	x	x	|
|	|	x	|	Dtodrobium cariniferum	x	|	x	|
|	x	x	|	DendrobiuiQ chryaantheum . . . . .	|	|	x	|
|	x	x	|	Dendrobium cretaceum . . . . .	|	|	x	|
|	x	x	|	Oendrobium Falconer's . . . . .	|	|	x	|

THE FLORANTY OF THE KACHIN HILLS NORTH-EAST OF MYITKYINA. 30!

India.	Himalaya.	U.S.A.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China	Malaja.
	—	x	—	<i>Dendrobium lituiflorum</i>	—	—	x	—
*	x	x	—	<i>Dendrobium nobile</i>	—	x	—	—
—	x	x	—	<i>Dendrobium Pierardi</i>	—	—	x	—
—	x	x	—	<i>Dendrobium transparens</i>	—	—	—	—
t	—	x	—	<i>Dendrobium Wardianum</i>	—	—	x	—
—	—	—	—	<i>Dendrobium papilliferum</i>	—	—	—	—
—	x	x	—	<i>Bulbophyllum Careyanum</i>	—	—	x	—
—	x	x	—	<i>Bulbophyllum leopardinum</i>	—	—	—	—
t	x	x	—	<i>Bulbophyllum reptans</i>	—	—	—	—
—	—	—	—	<i>Bulbophyllum suavissimum</i>	—	—	x	—
—	—	—	—	<i>Bulbophyllum fimbrilligerum</i>	—	—	—	—
—	—	—	—	<i>lone kachinensis</i>	—	—	—	—
—	x	x	—	<i>Cirrhopetalum maculosum</i>	—	—	—	—
—	x	—	—	<i>Cirrhopetalum refractum</i>	—	—	x	x
*	x	x	—	<i>Eria paniculata</i>	—	—	—	—
—	—	x	—	<i>Eria clavicaulis</i>	—	—	—	—
—	x	x	—	<i>Eria paucica</i>	—	—	x	x
—	x	x	—	<i>Eria stricta</i>	—	—	x	—
K	x	x	—	<i>Pachystoma senile</i>	—	x	x	x
—	—	x	—	<i>Spathogiottis pubescens</i>	x	x	x	—
X	x	x	—	<i>Phajus albus</i>	—	—	x	—
—	—	—	—	<i>Nephelaphyllum sp.</i>	—	—	—	—
—	—	x	—	<i>Tainia viridifusca</i>	—	—	x	—
—	x	x	—	<i>Anthogonium gracile</i>	—	—	x	—
—	x	x	—	<i>Agrottophyllum khasianum</i>	—	—	x	—
—	x	x	—	<i>Coelogyne Gardneriana</i>	—	—	x	—
—	—	x	—	<i>Coelogyne graminifolia</i>	x	—	x	—
—	—	—	—	<i>Coelogyne (near C. ochracea)</i>	—	—	*	—
X	x	x	—	<i>Otochilus fusca</i>	—	—	—	—
X	x	x	—	<i>Pholidota imbricata</i>	—	—	x	—

India.	Himalaya.	Arrasa	Hukuë Hey.	Name of Species.	Tapil. Uey.	ε	k G ø k ε	—
—	X	X	X	Pholidota rubia	—	—	—	—
—	—	X	—	Calanthe angusta	—	—	—	—
—	X	—	—	Calanthe brevicornu	—	—	—	—
—	X	X	—	Calanthe densi flora	—	—	X	X
X	X	X	—	Arundina bambusifolia	—	—	—	—
—	—	—	—	Eulophia longebracteata	—	—	X	—
X	X	X	—	Eulophia nuda	—	—	>	—
—	—	—	—	Cymbidium eburneum VAR.	—	—	X	—
X	X	X	—	Geodoru m di latatum	—	—	X	X
X	X	X	—	Rhyncostylis rttusa.	—	—	—	—
—	—	—	—	Stereochilus kachinensis	—	—	—	—
—	X	X	—	Aerides Fieldingii	—	—	X	—
—	X	X	—	Aerides multiflorum	—	—	%	—
—	—	—	—	Vanda Bensoni	—	—	X	X
—	X	X	—	Vanda leres	—	—	—	—
—	X	X	—	Saccolabium gacimatum	—	—	%	—
X	X	X	—	Saccolabium papillosum	—	—	?	—
—	—	—	—	Saccolabium obliquum ?	—	—	—	—
—	—	—	—	Saccolabium Cruddasianum	—	—	X	—
—	X	X	—	Sarcanthus filiformis t	—	—	—	—
—	X	X	—	Sarcanthus pallidus	—	—	X	—
—	X	X	—	Ornithochilus fuscus	—	X	—	—
—	—	X	—	Vanda filiformis &	—	—	X	—
—	X	X	—	Tropidia curculigoides	—	—	X	—
X	X	X	—	Goodyera procera	—	X	—	X
X	—	—	—	Pogonia car in ata	—	—	—	—
X	—	X	—	Pogonia Juliana	—	—	—	—
X	X	X	—	Epipogum nntans	—	—	—	X
—	X	X	—	Habenaria constricta	—	—	X	—
—	—	—	—	Habenaria Cruddasiana	—	—	—	—
X	X	—	—	Habenaria Galeandra	—	X	X	—

India.	Himalaya.	B M M 8	1 X u c e g	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
-	X	X	—	Habenaria geniculata . . .	—	-	X	—
—	—	X	—	Habenaria Helferi . . .	—	—	X	—
—	—	X	—	Habenaria furfuracea . . .	—	—	—	—
—	X	X	—	Habenaria Parishii . . .	—	—	X	—
X	X	X	—	Habenaria Susanns . . .	—	X	X	X
—	—	—	—	Habenaria Pottingeriana . . .	—	—	—	—
—	—	—	—	Habenaria trichosanthes . . .	X	—	X	—
X	X	X	—	Apostasia Wallichii . . .	—	—	X	—
—	X	X	—	Globba multiflora . . .	—	—	—	—
—	—	—	—	Globba sessiliflora . . .	—	—	X	—
—	X	X	—	Hemiorchis Pantlirgii . . .	—	—	—	—
X	—	—	—	Cu'cuma aromatica . . .	—	—	X	—
—	—	—	—	Curcuma plicata . . .	X	—	X	—
—	—	—	—	Curcuma Roscoeana . . .	—	—	X	—
—	X	X	—	Gastrochilus longiflora . . .	—	—	X	X
—	—	—	—	Gastrochilus pulcherrima . . .	—	—	X	X
X	—	—	—	Kaempferia Galanga . . .	—	—	X	X
—	—	—	—	Kaempferia margins ta . . .	—	—	X	—
X	X	X	—	Hedychium coccineum . . .	X	—	—	—
X	X	X	—	Hedychium coronarium . . .	X	—	X	X
—	—	X	—	Hedychium luteum . . .	—	—	—	—
—	X	X	—	Zingiber capilatum VAR. elata . . .	—	—	—	—
—	X	X	—	Zingiber chrysanthum . . .	—	—	—	—
X	X	X	—	Zingiber Zerumbet . . .	—	X	X	X
X	X	X	—	Alpina Galanga . . .	—	—	X	X
—	—	—	—	Ophiopogon cordylinoides . . .	—	—	—	—
X	X	X	—	Ophiopogon Wallichianum . . .	X	—	X	—
X	X	X	—	Hypoxis aurea . . .	—	X	X	X
X	X	X	—	Tacca laevis . . .	—	—	X	X
X	X	X	—	Dioscorea dsemona . . .	—	—	X	X

La. no.	X in a. a.	UPOS	X ₀ Sa a a V alley.	Name of Species.	H ₀ S ₀ e I ley.	China.	E. Indo-China.	7
x	x	x	-	Dioscorca oppositi folia	-	-	-	-
|	x	x	-	Smilax ferox	-	-	x	-
|	x	x	-	Smilax lanceaefolia	-	x	x	-
x	x	x	-	Smilax Roxburghiana	-	-	-	-
x	x	x	-	Smilax macrophylla	-	-	x	-
|	x	x	-	Tupistra aurantiaca	-	-	-	-
|	x	x	-	Dracaena ensifolia	-	-	x	-
|	-	x	-	Dracma spicata	-	-	-	-
|	-	-	-	Disporum oblanceolatym	-	-	-	-
|	x	x	-	Paris polyphylla	x	x	x	-
|	x	x	-	Polygonatum cirrhifolium	-	x	-	-
|	x	-	-	Polygonatum nervulosum	-	-	-	-
x	x	x	-	Monochoria vaginalis	-	x	x	x
|	x	x	-	Pollia Aclisia	-	-	x	x
x	x	x	-	Commelin bengalensis	-	x	x	x
x	x	x	-	Commelina obliqua	-	-	x	x
x	-	x	-	Commelina sal ici folia	x	x	x	/
x	x	x	-	Aneilema lineolatum	-	-	x	/
x	x	x	-	Aneilema scaberrimum	-	-	x	x
|	-	x	-	Aneilema triquetrum	-	x	-	-
|	x	x	x	Streptolirion volubile	-	x	-	-
|	-	-	-	Streptolirion volubile VAR. setosa	-	-	-	-
x	x	x	-	Floscopa scandens	-	x	x	x
|	x	x	-	Pinanga gracilis	-	-	x	-
|	x	-	-	Wallichia disticha	-	-	x	-
|	-	x	-	Phoenix humilis VAR. Loureirii	-	-	-	-
|	-	?	-	Plectocomia assamica ?	-	-	-	-
|	-	x	-	Arisaema album	-	-	-	-
|	x	-	-	Arisma concinnum	-	-	-	-
|	-	-	-	Arisaema petiolulatum	-	-	-	-

• ၂၄ •	Himalaya.	Arra can-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	၂၄	Malaya.
—	—	v	—	Typhonium cuspidatum	—	—	x	x
K	—	x	—	Typhonium gracile	—	—	—	—
—	—	x	—	Typhonium inopinatum	—	—	—	—
—	—	—	—	Typhonium Pottingeri	—	—	—	—
—	—	—	—	Amorphophallus Cruddasianus	—	—	—	—
—	—	—	—	AmorphophallusB sp.	—	—	—	—
—	<	x	—	Gonatanthus sarmentosus	—	—	—	—
v	x	x	—	Colocasia antiquorum	—	x	x	x
y	x	x	—	Alocasia indica	—	x	x	x
—	—	—	—	Stuednera capitellata	x	—	x	—
—	x	x	—	Lasia aculeata	—	x	x	x
—	x	x	—	Pothos Cathcartii	x	—	x	—
x	x	x	—	Pothos scandens	x	x	x	x
—	x	x	—	Pothos Vriesian us	—	—	—	—
x	x	x	—	Sagittaria sagittifolia	—	x	x	—
x	—	x	—	Aponogeton crispus	—	—	x	—
x	—	x	—	Potamogeton perpusillus.	—	x	x	—
x	x	x	—	Liphocarpa argentea	—	x	x	x
x	x	<	—	Bulbostytis capillaris VAR trifida	—	x	x	x
x	x	x	—	Carex baccans	—	x	—	x
..	x	x	—	Carex cruciata	—	—	—	—
x	—	x	—	Carex flicina	—	x	—	x
—	x	x	—	Carex epiculata	—	—	—	—
x	x	x	—	Carex stramentitia	—	—	—	—
x	—	x	x	Carex Thomsoni	—	—	x	—
—	x	<	—	Setaria italica	x	x	x	x
X	x	K	—	Coix Lachryma	—	x	x	x
X	x	x	—	Anthistiria scandens	—	—	x	x
—	—	—	—	Dendrocalamus Brandish'	—	—	x	—
mm	x	x	—	Pseudostachyum polymorphum	—	—	x	—

Sh. 3.	2. JS E	Arco c - Assam.	Sh. 3. Valley.	Name of Species.	Sh. 3. by.	Sh. 3. E.	Sh. 3. E.	1.
|	X	|	|	Cephalostachyum Fuchsianum	|	|	|	|
x	X	x	|	Equisetum debile . . . . .	|	|	x	x
|	X	x	|	Equisetum diffusum.	x	|	|	|
x	X	x	|	Lycopodium cernuum . . . . .	|	x	x	x
|	X	x	|	Selaginella canaliculata . . . . .	|	x	x	|
|	X	x	|	Selaginella picta . . . . .	|	|	|	|
|	X	x	|	Selaginella Wallicbii . . . . .	|	|	x	X
x	X	x	|	Davallia chinensis . . . . .	|	X	X	X
|	|	x	|	Davallia Griffithiana	X	X	X	X
|	X	x	|	Onychium auratum	X	X	X	X
x	X	x	|	Pteris biaurita . . . . .	|	X	X	X
|	X	x	|	Blechnum orientale . . . . .	|	X	X	X
|	X	x	|	Asplenium Finlaysonianum . . . . .	|	|	X	X
X	X	x	|	Asplenium planicaule . . . . .	|	|	|	|
X	X	x	|	Aspidium aristatum. . . . .	|	X	X	X
X	X	x	|	Nephrodium falcilobum . . . . .	|	X	X	X
|	X	x	|	Nephrodium Leuzeanum	X	X	X	X
X	X	x	|	Nephrodium membranifolium	X	|	X	X
x	X	x	|	Nephrodium variolosum . . . . .	|	|	X	X
|	X	x	|	Poly podium leiorrhizon . . . . .	|	|	|	|
|	|	x	|	Platynerium Wallichii . . . . .	|	|	|	X
X	X	x	|	Gymnogramme javanica . . . . .	|	x	X	|
X	X	x	|	An trophy urn plantagineum . . . . .	|	|	X	|
X	X	x	|	Acostichum appendiculatum	x	x	X	<
X	X	x	|	Lygodium pinnatifidum	x	x	X	*
X	X	x	|	Helminthostachys zeylanica . . . . .	|	X	X	*
X	X	x	|	Ophioglossum vulgatum . . . . .	|	|	X	*

Synopsis of Distribution of Kachin Species.

Kachin Hill plants sent to Herbarium Calcutta, during the year 1897							637
Endemic in the Catchment-area of Upper Irrawadap (Hukung-Kachin-Taping) cutting elsewhere than in the Kachin-Taping; area							53 574
Distributed Westward only.							135
India	Assam						3
Himalaya							8
India	Himalaya	Assam					11
	Himalaya	Assam					7
distributed both Westward and Eastward from the Kachin Hill.							408
With Western influences predominating.							173
India	Assam	Shan	Malaya				1
Himalaya		Shan					1
India	Assam			China			1
Himalaya	Assam		Malaya	China			1
Himalaya	Assam		Malaya				1
Himalaya	Assam		Malaya				3
India	Assim	Shan					6
Himalaya	Assam			China			11
Himalaya	Assam	Shan		China			12
Himalaya	Assam	Shan					87
Himalaya	Assim	Shan	Malaya				36
Himalaya	Assam	Shan					7a
V» Uh Western influences counterbalanced by Eastern							184
India	Himalaya	Assam	Shan	Malaya	China		100
Himalaya	Assam	Shan	Malaya				34
Himalaya	Assam	Shan					34
Himalaya	Assam	Shan			China		14
Himalaya	Assam				China		5
India		Shan					3
India		Assam	Shan	Malaya			2
Himalaya		Shan					3
Himalaya	Assam		Malaya				2
India	Himalaya		Malaya	China			1
India	Himalaya	Assam	Malaya	China			1
Himalaya	Assam		Malaya	China			1
India	Himalaya	Assam	Shan		China		1
Himalaya			Malaya		China		1
India			Malaya		China		1
India					China		1
With Eastern influences predominating							51
Himalaya	Assam	Shan	Malaya	China			19
Himalaya	Assam	Shan	Malaya	China			10
Himalaya	Assam	Shan	Malaya	China			9
India	Assam	Shan	Malaya	China			5
Himalaya	Assam	Shan	Malaya	China			5
Himalaya	Assam		Malaya	China			1
India		Shan	Malaya				1
Himalaya		Shan	Malaya				1
Distributed Eastward only							31
		Shan					1
		Shan	Malaya				4
				China			3
		Shan	Malaya	China			2
			Malaya				1

TOTALS.	318	416	522	403	228	105	[ENDEMIC. . . 8'45' .]
Per cent	34'75	66'34	83'25	64'11	36'35	31'70	
	INDIA	HIMALAYA	ASSAM	SHAN.	MALAYA.	CHINA.	

There is a very appreciable endemic element in the Kachin Flora; the collections of the first year of exploration contain 53 apparently endemic forms out of a total of 627, making about 8.45 per cent., of the whole. Of the remaining eleven-twenty species, making only 4.94 %, or about one-nineteenth part of the whole flora, are purely eastern in distribution ; occurring, that is to say, in China, in the Indo-Chinese area east of the Irrawaddy, in Malaya, without extending westward and southward along the Arracan ranges. Of these 31 plants, as many as 21 extend as far as is known, to the Shan Plateau. Nor do those plants while they extend both eastwards and westwards from the country are more widely spread to the east than they are to the west of these hills, bulk very largely ; of such, the list contains 51, again about one-twelfth or 8.13 percent, of the whole flora. Even if we add these to the purely eastern species, we obtain a total of 82, making 13.07 per cent, or something like one-eighth of the whole flora, wherein eastern influences may be said to predominate.

The western and eastern influences are counterbalanced in 29.34 per cent of the species, or nearly one-third (29.34 percent) of the number presented by our list; of these as many as 100, or 57.14 (one-sixth of the flora) occur in every part of south-eastern Asia, the majority being cosmopolitan tropical or sub-tropical plants.

The element wherein western influences predominate exceeds that which indicates eastern affinities, and, indeed, considerably exceeds that where the two influences are balanced. There are 135 species, nearly one-fifth (more exactly 21.53 per cent) of the flora that extend westward only, while as many as 173, or 27.59 per cent (more exactly 27.59 per cent) of the whole, are spread to the west than to the east of the Kachin country. If these two groups of species be added, we have a total of 308, nearly half (more exactly 47.54 per cent) of the flora wherein western influences predominate. The total number of species that occur in Assam, the Himalayas, or India, is 543, as against 439 in China, Eastern Indo-China, or Malaya.

When the distribution in particular sub-sub-areas is considered we find that more light is thrown on the precise affinities of the Kachin flora. Though Kachin is situated close to China, its obviously not very closely allied to the Chinese flora. Only 195 Kachin species, 31.10 per cent, or rather less than a third of the flora, occur in China at all, and there are, in the whole list, but three species, *Wistaria chinensis*, *Rhododendron indicum* and *Rauwolfia*.

plants that are peculiarly Chinese. The meagreness of the which is emphasised by the fact that in Malaya, with the aid of Indo-China intervening, and in India with Assam intervening, & we find respectively 228, or 36.36 per cent., and 218 or 34.76 per cent, of our Kachin Hill plants.

In Eastern Indo-China we find almost twice as many Kachin plants as we do in China, the number and percentage being 402 and 64.2, respectively. The especially Indo-Chinese element is as great, for there are twenty-one Kachin plants that occur in Eastern Indo-China, only on the Shan Plateau or in Prome, Tonquin, and Siam. Still the number of Kachin Hill species in Eastern Indo-China is exceeded by the number that occur in the Eastern Himalayas, with 415, or 66.34 per cent of our plants extend to the Malayan element is. however, only about one-third the number of the Shan element, for there are but eight Kachin species peculiar to the Shan element, as against the twenty-one peculiar to the Kachin Hills, both (to the Himalayas and to the Assam) to occur in Eastern Indo-China at all, We are not to realize how small the Shan element really is. There are only 67 species, or 10.68 per cent., of the flora, that belong to this category, more than thrice the number that are peculiar to the Kachin flora are thus manifestly characteristic of the Himalayan and Assam-Sub-sub-areas particularly the latter, since 522 species, 78.6 per cent of the whole list occur in the Assam-Kachin area. These species are peculiar to Assam. The Mishmi-Kachin block then, so far as the evidence derived from the present collection in its Kachin section goes, must be treated as part of the Indo-Chinese, or even the Himalayan regions.

The comparative value of the influences exerted by the four adjacent areas of China, the Eastern Himalaya, Indo-China east of the Irrawaddy Valley, and the Assam-Arracan range?, are however more accurately determined by employing in succession the numbers indicated by each actual distributional arrangement that occurs. By treating the figures thus attained as numerators and by using as denominators the number of adjacent areas involved in each case, we obtain a series of fractions the sum of which gives us a number that indicates the proportional influence of each adjacent area in the

composition of the Kachin flora. It is unnecessary here to do more than indicate the results thus attained, which are as follows:—

Assam	230*3,	or	40*1	%
Himalaya	128*4,	or	22*4	%
Shan	154*9,	or	27	%
China	604,	or	10*5	%
(Distributed species)	574		KO	

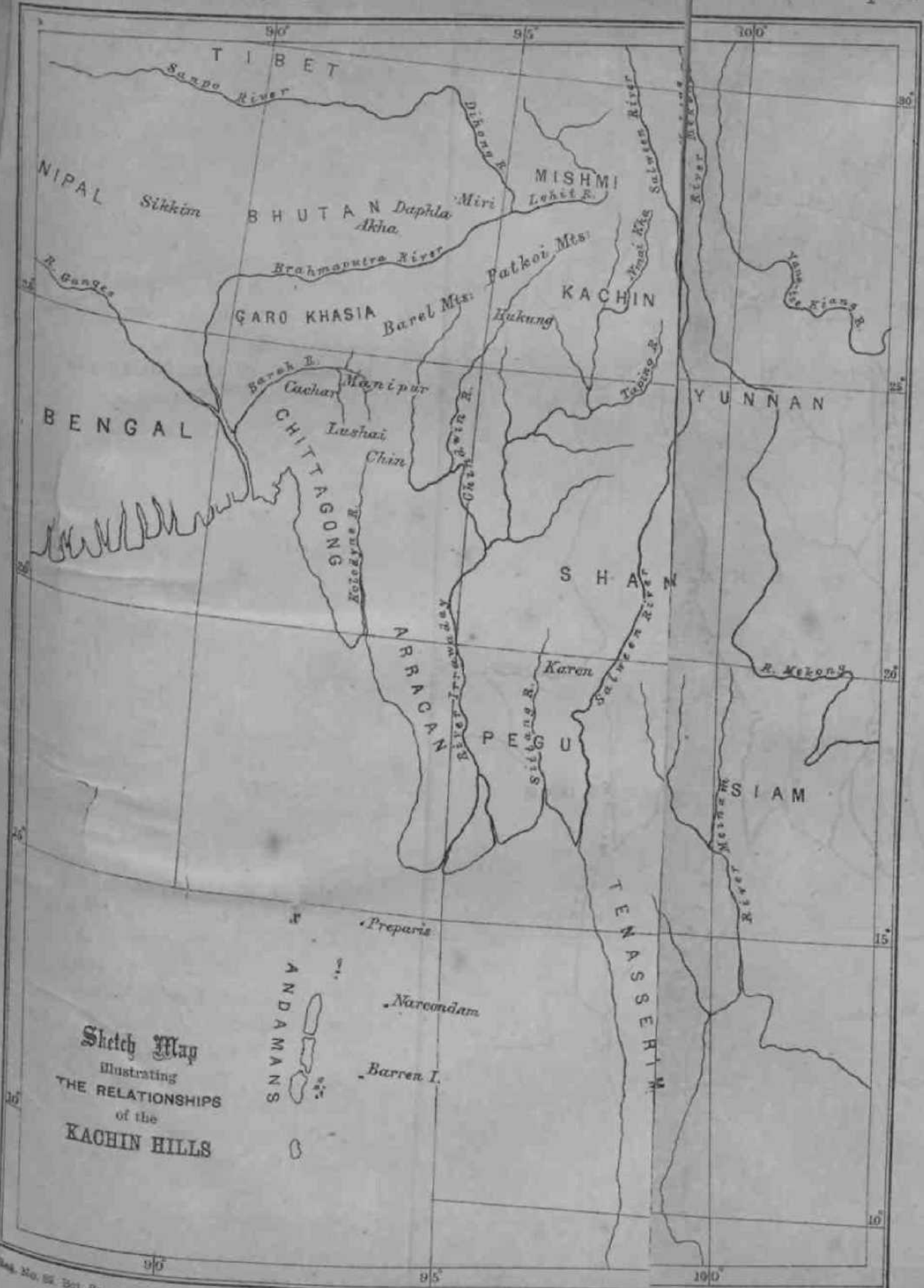
Here again the slightness of the affinity with the Chinese flora and the paramount influence of the Assam-Arracan flora is very manifest.

A synoptic view of the systematic character of the collection is given in the following table:—

Systematic Synopsis of Kachin Plants reported during 1897.

Phanerogams		99	387	601
Dicotyledons		84	302	441
Polypetales	43		132	190
Thalamiflorae	15		39	48
Disciflorae	13		37	36
Calyci florae	15		66	106
Gamopetales	28		124	183
Incomplete	13		46	68
Monocotyledons		15	85	160
Cryptogams		4	18	26
TOTALS	NAT. ORDERS	103	Genera . 405	Species . 627

The most extensively represented natural order is *Orchidaceae*, with 77 species, followed by *Leguminosae* with 60 species; *Acanthaceae* 26; *Rubiaceae*, 25; *Labiatae*, *Urticaceae* and *Filices* each 20; *Euphorbiaceae* 18; *Compositae*, *Scitamineae* and *Aroidae*, 17 each; *Vetbenaceae* 14; *Gesneraceae*, 13; *Liliaceae*, 11; and *Commelyneae*, 10. Of those natural orders with less than ten species, *Rosaceae* has 9; *Rutaceae*, *Asclepiadaceae* and *Cyperaceae* 8 each; *Malvaceae*, *Apocynaceae* and *Lauraceae*, each 7; *Sterculiaceae*, *Ternstroemiaceae*, *Cucurbitaceae* and *Gramineae*, each 6. There are six natural orders with five representatives, seven with four species, thirteen with three species, nineteen with two species, the rest with but one species each.



Sketch Map
 illustrating
 THE RELATIONSHIPS
 of the
KACHIN HILLS

From the Journal, Asiatic Society of Bengal, Vol. LXIV, Part II, No 3, 1895.

On a new species of RENANTHERA.—By G. KING and D. PRAIN, Royal Botanic Garden, Calcutta.

[Bead July, 3rd.]

Some years ago Lieutenant E. J. Lugard sent to the Calcutta Herbarium, for identification, some dried flowers and a living plant of what was evidently a species of *Renanthera*. The living plant unfortunately soon died in the uncongenial climate of Calcutta; the dried flowers were, however, sufficient to show that the plant probably belonged to a species near *R. coccinea*, Lour. Last year Lieutenant J. B. Chatterton was kind enough to send several plants of the same orchid to the Calcutta Garden, which were promptly transferred to the more suitable climate of the Cinchona Plantation in Sikkim. These plants flowered a few weeks ago and there is now no doubt that they belong to an undescribed species which from the resemblance of its flowers to the extended wings of a brilliantly coloured butterfly we now name *R. PapiHo*. For a description of the flowers, drawn up from living specimens, we are indebted to Mr. R. Pantliug, of the Cinchona Plantation, who has also made a beautiful coloured drawing of the plant.

RENANTHERA PAPILIO, n. sp. King and Prain. *Leaves* loriform, 2 to 2*5 in. long and about '5 in. broad; their apices blunt and unequally lobed. *Inflorescence* 9 to 10 inches long, laxly racemose, or rarely paniced, on stalks of about equal length or longer, the bracts ⁸ ~~the~~ stalked ovary about 1 in. long. *Dorsal sepal* linear-oblong, ~~contracted~~ below the blunt sub-cucullate apex, #75 in. long. *Lateral sepals* twice as long as the dorsal, narrowly elliptic, flat, with undulate ^{ca}ges, the inner margins touching above the slender twisted claws; the ^aapices sub-acute and divergent. *Lateral petals* "5 in. long, spathulate, ^slightly incurved. *Lip* with acuminate-side lobes each with a small ^rounded basal auricle, the middle lobe broadly ovate, concave, its apex ^acute and pointing forwards, the base auricled. *Spur* short and blunt, with two erect toothed divergent plates near its mouth. *Column* minutely ciliate behind the anther; *stigma* with a thin deflected transi-
e n t lip.

Assam.

The colour of the flowerets a brilliant scarlet with a tinge of lake. The toothed plates of the spur end abruptly at the base of the middle lobe of the lip and immediately in front of their termination there are three Munt tooth-like processes. In its habit and the colour of its flowers the species resembles *R. coccinea*, Lour., but the flowers are larger and the lobing of the lip and the shape of the lateral sepals are ^{ve} different.

From the Journal, J . . . Society of Bengal, Vol. LXVII, Part II, No. 2,
1898.

Descriptions of some new plants from the North-Eastern Frontiers of India.
—By G. KING and D. PRAIN.

[Received January 29th; Read March 2nd, 1898.]

While dealing with various collections received from the North-Eastern Frontiers of the Empire in connection with the Botanical Survey of India, the writers have had to dispose of a number of species that appear to be new to science and that the Herbarium of the Royal Botanic Garden, Calcutta; the paper contains descriptions of a few of the « B » W * of these. A considerable portion of them at Kew certain t, * % were unknown or unrepresented * o * h " " " " vailed collection ere; our thanks are due to Mr. Thiselton-Dyer, the Director, and to Dr. of the Assistant for India in the Herbarium there, for kind •mutj, connection the examination of these.

ANONACEÆ.

1. GONIOTHALAMUS PEDUNCULARIS King & Prain, frutex?, ramulis gracilibus glabris. Folia tenuiter coriacea, oblonga, plus minusve oblanceolata, breviter acuminata, basi cuneata; utrinque glabra, hebetis, subtus ex sicco ^{panide} brunnea; nervis secundariis 10-12-jugis curvis intra marginem inosculantibus subtus plus minus prominentibus supra obsolete; petiolis brevibus 25-3 poll. longis, laminis 6.5-9 poll. longis, his 1.5-2.5 poll. latis. * » es solitarii erecti parum supra-axillares 1* Poll. longi, pedicellis plus quam uncialibus adpresse puberulis, basin minute bracteolatis. Sepala carnosae, libera, ovata subacuta ^P utrinque puberula, 3 poll. longa. Petala carnosae, series exteri oblique ovato-lanceolata, acuminata, basi angustata et in crassata ubi intus excavata, extus adpresse pubescentia intus basi puberula ceterum glabra 1.5 poll. long, .75 poll. lata; petala series interioris ovata, acuta basi angustata utrinque sed praesertim extus pubescentia, dimidio summo in calyptram basi «fenestrata» cohaerentia. Antheras oo, sessiles lineares apice capitatae. Pistillia circa linearia, stylis linearibus pubescentibus duplo breviora. Fructus non communicatus.

In BURMA SUPERIORE: in montibus Kachin nuncupatis, Kingii mercenar.!

Of all the Indian species of this genus *G. peduncularis* most resembles the Ceylonese *G. Gardneri* H. f. & T. and fits *Thiseltonii* H. f. & T.

STERCULIACEAE.

2. STERCULU COGNATA *Train*; arbuscula ramulis gracilibus parce puberulis cortice brunneo obtectis. *Folia* glabra brevissime petiolata vel sessilia anguste lanceolata medio versus basin sensim attenuata apice anguste ovato-acuminata, marginae integra, chartacea, subtas prominentius 25-30-nervi simulatque reticulato-venosa. *Flores* albi pedicellati pedicellis filiformibus glabris, in racemis quam folia dimidio brevioribus filipositi; *calyce* campanulato laevi intus glabro extus parcissime puberulo, lobis linearibus erecto-patentibus tubo multo longioribus. *Follicula* oblonga acuta breviter pedicellata exfuso velutina intus glabra hinc rubra; semina nigra nitida subsphaerica.

In montibus Kachin nuncupatis; *Kingii mercenar.* /

Folia 8-12 poll, longa, 7.5-2*5 poll, laeva, petiolis nunquam 2 poll, saepius omnino absentibus; *racemis* 4 poll, longis, pedicellis capillaribus 3 poll, longis; *floribus* 6 poll, longis; *folliculis* 2.5 poll, longis, 7.5 poll, latis; *seminibus* 5 poll. diam.

Nearest 8. *Sozburghii*, *S. parvifolia*, and 8. *striatiflwa* but easily distinguished by the sessile leaves and the other characters mentioned.

CONNARACEAE.

3. TAENIOCELAENA BIRMANICA *Train*; frutex ramulis puberulis teretibus cortice minute lenticellatis. *Folia* imparipinnata, foliolis 2-3-3^ugis, coriaceis, nervo mediano supra puberulo excepto glabris, oblongo-anceolatis apice emarginato-caudatis basi inaequaliter cuneatis breviter petiolulatis, rachide puberulo. *Flores* in racemis brevibus vel paniculis congestis axillaribus dispositi, bracteis minutis, pedicellis longiusculis. *Alyx* bagj hemisphaericus, laciniis valvatis oblongis acutis fructu involutis. *Petala* ... *Stamina* 10, alterna paulo breviora, filamentis basi connatis. *Garpella* 5, sessilia, styli parum elongati, puberuli. *Petalae* 1-3, sessiles, ovoideae, parum apiculatae, extus intusque glaberrimae. *Semen* oblongum basi arillo adnato dimidiate suffultum, striatum nitida; cotyledones amygdalinae.

BURMA : in montibus Kachin nuncupatis, *Kingii mercenar.*!

Folia 6-8 poll, longa, rachide 3-4 poll., lamina terminali 3-5 poll. longa 1-5 poll, lata, lateralibus 1.5-3 poll, longis, petiolulis 1.5 poll. *Racemis* 1.5-2 poll, longis, pedicellis 3-4 poll, longis. *Oapsulis* 6 poll. 10^Qgis, 3 poll, latis.

Much resembles the only other known species, *T. Griffithii* Hook, fil., f. Malacca, but with differently shaped leaflets and with fruits that are glabrous externally instead of pubescent.

LBGu MINOSAE.

4. INDIGOFERA NIGRESCENS

ramulis adpresse brunneo-setosi
 membranaceis, atro-viridi
 in racemis an
 linearibus alabastri
 campanulato, dentibus
 Legumen Hneare turgidum
 latum, su
 In montibus B u S T 1 T⁶⁸
 In montibus Kimw, viop TLT-TM*¹ • ifmn! ^ >> 5848!
 Tapie, FUNNAN aus
 montibus S H ^ ad ilaymr? &PUd Momien ^ * * * * * In
 Alu M poll., S_a -s merC8S<B₁ 7
 *poU. longi, peduncul¹ i¹ f¹ Po¹ lon ^ *3-4 poll. lata. fttw"
 Poll, longo, CO^JJ, > 2 -oll, .o f¹ > «wteis -2 poll., calyce OS
 tongumj -1 poll, crassumf " ^ tantum. •0%<>>> '75-85 P<>>

very closely related f
 »en often identified and i J I¹ j W * * a * ^ P * « i wifli which it has
 collections. The smaller S I ^ name J * » anally met with in
 palate and pabernlous ZTI^l ha¹ <0%*teetb, shorter faintly
 very dart green leaves with m^ Of lab^ cent pods, as well as the
 amply distingnish it. m¹ name « " « and much smaller leaflets

5. SPATHOLOBUS POTT

ra*18 cylindraceutis giMaioirih *1 P¹ P¹ frutex « *ndens robuste,
 P<3s₁₈ sparse pubescentibu" i £ * * * brttneis. P ^ que reflexo-ad-
 P<tentibu₈ pauy, fnsco.h.irsJ 0 ^ P<nnati_m 3-foliolata rachide pito
 "Migme sinnatis sa_{pra} nniform, u¹ oliol¹ sub <=ori<<eis ambita oratis
 sparse, hirsntis, nervo me di Z ^ u¹ praesertim nereis pilis adpressis
 patentibua strigoso, foliola T!!- " I * 08 P^e <olulisque breribns pffi-
 feuncata nerris prnhmsbzZz v¹ T ^ ^ l a t e e c t m t e 8 p i f e) 8 t o
 wbulato product fefe ^ i ^ ? l b w >> * * * mediano in acumine
 inaequali int_M cuneatis *£ hw panIl_o minaritas hasi P>>"<>
 Jngis, mediano nltra a p, o em T T¹ to, rotndatis nervis lateralibns 7-8-
 lanceolatis stipelli_{sque} p a l S ? 8 " " ^ P ^ ncto, stipalis decidnis
 ««emosi in pani_{en}is terna Su¹ v S nbtlati ad p^{res} » hirsntis. Flares
 paromi pubescentibns disp¹ t; f ^ terre ramosis » " & an ^ lati S
 Peicelhs capillaribns cal/ce i LTT * bt & ^ mie cadncis inh w * .
 •Jdento sommo apiceemarSr¹ ?' * * * de Me olivaceo-renti-
 tebo parom brevioribns. (££? " * * * anguste deltoidis onurib-
 cancato apice emarginat ^ * ^ * ? * * * fil¹ « flo mngne ang ^ ^
 ^ u e n s alar¹ 1 ^ 1 ^ ^ Uibus 8 << flSus calycem
 ntrinqe barbellatis.

Stylosanthes 2-adelphia filamentis vaginae carinalis alternis longioribus, filamento libero vexillari quam vaginam multo brevior. *Ovarium* puberulum breviter stipitatum, ovulis 2. *Legumen* ignotum.

in montibus KACHIN nuncupatis, apud Namli, 2000 p. s. m., Pottinger j

Ramulis floriferis '25 poll. diam.; *foliis* 8 poll, longis, rachide 2*5 poll. parte terminali partem petiolarem fere aequante, petiolulis *15 poll. stipellia «2 poll, brevioribus, stipulis '25-3 poll, longis; lamina terminali 6,5 poll, longa 4 poll, lata, lateralibus 4*5 poll, longis his 3 poll. lacini acuminibus apicalibus *3 poll, longis. *Panicula* totapyraraidali "Pedalis, paniculis secundariis 8-10 poll, longis, iisque ordine tertio ceteris. *Stipulis* singulis 1'5-2-pollicaribus, 12-20-floris, pedicellis 12 poll, calyce '2 poll, corolla '3 poll, longis.

A very fine plant nearest to the Malayan species *S. gyrocarpus* and *S. faruyinetu* but abundantly distinct from these and from all the other species by the sinuate finely apiculate leaflets.

CRUDDASIA PKAIN.

Stipulae lobis acuti, 2 superiores in numero apice minute 2-dentatum connatae caetera aequilata triangulares infimo tamen lateralibus parum connatae, Vexillum suborbiculatum, basi nee inflexum; alae oblongo-angulatae ciliae adhaerentes; carina cymbiformis erostris alis aequilatis ovato-vexillare caeteris arete connatum, antherae uniformes. *Ovarium* sessile oo-ovulatum; stylus filiformis incurtus sub stigmate terminali summo apice parce penicillatus ceterum glaber. *Legumen* elongatum 2-valve, planum, coriaceum, compressum intus inter semina tenuiter foveolatum. *Semina* plano-compressa, suborbicularia, hilo ova to, rostro hilofixa. *Oculis* alte volubilis, foliis pinnatim 5-foliolatis, foliolis angulatis, stipellatis. *Stipulae* spiculoso-setaceae caducae, basi fixae. *Fllores* purpuri ascentes, in pedunculis elongatis fasciculato-aeo-mosi fasciculati in rachide nodiformi. *Eiacetae* bracteolisque caducae. *Calycis* vexilloque extas sericeus.

Qualis species siugula, montium Kachin incola. Genus subtribus *Galactiae* wearum, praesertim sectioni *Collseae* generis *Galactiae* cui etiara *Stipulae* vexillare cum ceteris medio connatum, vel *Diocliearum* praesertim *Stipulae* Puerari & fere aequae recte attribueudum: statim tamen ab *Stipulae* *Euphaseolarum* nonnullarum circa stigma barbato *Stipulae* ue potius pro genere distincto *Dioclieis* uti *CUtoria Glyciueis* habenda.

CRUDDASIA INSIGNIS Train.

** Baotibus KACHIN nuncupatis, 5000 p. s. m., *Kingii mercenar.*!

Stipulae 2-4 poll, rachides cominuni 1'5 poll, frupra canaliculati,

retro-setosi, laminae ovato-lanceolatae 3-6 poll, longae, 1'5-2* Poll, latae, supra glabrae, subtus adpresse pubescentes, inter nervis 12-15- jugis subtus prominentibus reticulato-venosae; stipellae filiforme s '1 poll, longae, petiolulae 1'5 poll, longae; stipulae rigidae '2 poll. 1 on e rae, Bacemi 8-12 poll, longi pedunculis 3 poll, longis, nodis vix '2 J, h, remotis, pedicellis -12 poll, longis. Galyx *2 poll, tubo campan Q1, to deutibus aequilongo. Corolla #4 poll, longa, vexillo orbiculato '30 P oll. lato, extus dense sericeo. Legumen 3 poll, longum, *3 poll- latum, seminibus 10-12, '25 poll, longis, '2 poll, latis.

7. PUERARIA DBLLA Prain; volubilis ramis gracilibus glabns, f iis 3-foliolatis stipulis caducis stipellis capillaribus, foliolis chartac eis ovatis longe acuminatis basi cuneatis utrinque petioloquo g l bris, petiolulis parce puberulis. Flores in racemis elongatis simp eibas vel parce ramosis dispositi, rachide parce puberulo, pedicellis b, evis- simis, bracteis deciduis bracteolis 2 sub calycem persistentibus coi dato- ovatis parce puberulis. Calyx campanulatus glabrescens, seg mentis 2 summis in labium apice emarginato truncatura connatis, caetens ovatis obtusis subaequilongis omnibus tubo parum brevionbus. Corolla r- pura calyce plus duplo longiore» vexillo basi auriculis inflexis app endi- culato, carina rectiuscula alas subaequante. Stamen vexillare o manino solutum, antherae uniformes. Ovarium sessile oo-ovulat un stylus filiformis superne inflexus, imberbis; stigma capitatum. Legumen ignotum.

In montibus KACHIN nuncupatis, prope Myitkyina, Kingi mer- cenar.l

Foliola 6 poll, longa, 3 poll, lata, stipellis filiformibus '25 poll. longis, petiolulos aequantibus. Bracteolae '1 poll, longae. Calyx •25 poll, longus. Corolla 7 poll, longa.

This very distinct species belongs to the subgenus *Netistanthus*, * hich is marked by having entire leaves that are contemporaneous wi ik the flowers. The general appearance of the plant most readily recalls that of *Pueraria Thunbergiana* but its scipules are not persistent as in that species and the calyx is widely different. The fact that the v axillary stamen is quite free marks it as an aberrant *Pueraria* to w Pla near *P. peduncularis* which exhibits the same character. The no wers— though not the bracts—recall those of *Mastersia assamw a* * till ripe fruits are reported it can not be quite certain that it should no t referred to that genus. Meanwhile it is most satisfactorily locate d in *Pueraria* of which it has all the facies.

8. DERRIS LATIFOHA Prain; arbor alta, foliis magnis, folio m is i » chartaceis ovato-lanceolatis apice acuminatis basi cuneatis vel flubro lun- datis. Flores in paniculis amplis thyrsoideis axillaribus & v obli-

Toniisque glabris angulatis nodis nec tumidis nec productis, pedicellis distinctis apprimatis; calyce glabrescente campanulato margine truncato; corolla ae vexillo erecto orbiculari, basi eaciloso rotundato; filamenta 2-adelphia glabra; ovario puberulo, ovulis 3. Lenticillae ligulatum tenue glabrura suturis utrinque alatis nec sinuatis.

An montibus KACHIN, apud Namli, 4000 p. s. m., *Kingii mercenar.!*

Folia 18-24 poll, longa, foliolis 8-10 poll, longis 3*5-4 poll. In tinque glabris petiolulis '25 poll, longis. *Paniculae* 20-25 poll, longae, ramulis 2-3 poll, longis; pedicellis '1 poll, longis; *calyce* '12 poll, longo corolla '3 poll, longa, vexillo '35 poll, lato; *legumine* '15 poll, longo; *staminibus* 9 poll, longis; *ovariis* '2 poll, longis subaequilatis.

This species is very nearly related to *D. thyrsiflora* which much resembles the latter respect it more nearly approaches *D. Wallichii* of which we were formerly regarded as a large flowered variety. The Daich larger leaflets however and the fact that this is a tall tree & preferable to treat it as a distinct species.

9. *ALBERGIA KINGIANA Prain*; frutex scandens lignosa, cortice lenticillae foliolia 5-7 anguste ovatis apice breviter acuminatis, basi subulatis subtus sparse puberulis, coriaceis. *Mores paniculis axillaribus, foliis brevioribus, ramulis subcorymbosim petiolulis brevissimis; calyce dense ferrugineo, dentibus 3 anguste triangulis, staminibus brevioribus latioresque excedentibus. Ovario 2-ovulato; stylo subulato. Legumen ignotum.*

In montibus KACHIN nuncupatie, *Kingii mercenar.!*
Foliola 2-5-3 poll. longa, 1-1*25 poll, lata; rachide 3 poll. longa petiolulis '25 poll, longis; paniculae 35 poll, longae, ramulis 1-1*5 poll. longis, floribus '25 poll, longis.

Very near to *Dalbergia Benthami* Prain, (*D. rubiginosa Benth. Flor. Hong-Kong*, 93, not of Roxb.) from Hong-Kong, but with quite different leaflets and rather longer panicles of similar flowers. Also near *D. Benthami* Prain, from Western India, but again with different leaflets and rather larger flowers. In general appearance *B. Benthami* resembles the Chinese plant to which Mr. Bentham has referred it, but the leaflets of the Chinese plant are thicker, narrower towards the tips, and have a different pubescence beneath; the flowers too of the Chinese plant are very like those of the present Kachin species and are considerably larger than there of *T. rubiginosa*.

10. *AUJHIA POTTINGERI Prain*; robusta scandens, ramulis lenticillatis, foliolis ovatis, basi cordatis, quadrante anfico sinu angusto apiculato

2-loba; crasse coriacea, supra nervis parce hirsutis exceptis glabra su^{bt n^}
 parcissime ferruginea, nervis 9-U, petiolo glabro, stipulis caducis. ^{Fl or e}
 racemosi, racemis terminalibus ferrugineo-velutinis bracteis lanceolatis
 pedicellos erecto-patentes fere aequantibus, bracteolis bracteis simili^{bus,}
 alabastris clavatis parte superiore. oblonga basin ampullaeformem ^{exce-}
 dente. *Calyx* ferrugineo-pubescentis, limbo 5-partito segmentis ^{ooIoT1 c o-}
 lanceolatis tubo basin, versus parum dilata+o. *Petala* 5, subaeq^{ua lia}
 oblanceolata obtusa, longe unguiculata magnopere exserta, un^{n ue}
 dense sericea. *Stamina* 3 fertilia, antheris lineari-oblongis, filamentis
 medio parum incrassatis. *Ovarium* distincte stipitatum, dense ferru^{ferru}
 ineum, stylo crasso ferrugineo, stigmate obliquo peltato. ^{ueg}
 ignotum.

In montibus KACHIN nuncupatis, inter Namlao et Bansa^{rao,}
 Pottinger!

Folius 2-5-4 poll, longis, his 2-25-3 poll, latis, petiolo 1 ~ V 6 ^
 longo. *Racemis* 6 poll, longis, 4*5 poll, latis, pedicellis .75 poll. ^ ^
 alabastris 175 poll, longis. *Calyx* tubo .75 poll, limbo 1 V o U, " ^
Petalis 2 poll, longis. *Filamentis* 2'5 poll, longis.

A very fine species, nearest to *B. nervosa*, a Khasia plant^{from}
 which it differs in its leaves with fewer nerves, its shorter pedice^{ls}
 its rather larger petals silky instead of rusty externally. ^{T n lift size f s}
 its flowers its only rival in the group to which it belongs is & ^{exce s a}
B. excelsa from Borneo; the shape however of the petals is different,
 those
B. excelsa being narrower and more acute at the apex.

SAXIFRAGACEA J.

11. HYDRANGEA POTTINGERT Prain; fruticosa, ramis novellis ^{unbe-}
 scentibus; *foliis* oblongo-lanceolatis acuminatis margine ^{o fsi cuneat}
 excepto serratis, utrinque nervis adpresse puberulis ceterum ^{olabr ^}
 nervis 9-10-paribus ascendentibus; cyma ampla dichotoma ^{r . 1 ^ ^}
 pedicellisque pubescentibus ebracteata, florum radiantium ^{e a}
 breviter unguiculatis late ovatis subacutis versus apicem gross^{s p}
 ceterum integris venis prominulis utrinque reticulatis glabris, ^{e serratis}
 dentibus calycinis triangulis tubo brevioribus; *petalis* . . . ^{fertilium}
inibns. . . . ; *stylis* 3 erecto-patulis ovario globoso P^{stam-}
 brevioribus. ^{a putn}

In montibus KACHIN nuncupatis, 4100 p. s. m., Pottinger!

Folia 3-4 pollicaria, 1*25 poll, lata, petiolis -5-'6 poll- ^{Cyma pe-}
 dunculo 1*25 poll, longo, pedunculis secundariis 1-pollicaribus, ^{licellis}
 florum radiantium gracillimis 1'5 poll., pedicellis fertilibus '2-
Capsula '08 poll. diam.

POTTINGERIA PRAIN.

ovatus tubus brevis late campanulatus basi ovarii adnatus, lobis 5
 acutis persistentibus sinibus latis. *Petala* . . . *Stamina* 5
 erecta marginem disci perigyni affixa, filamentis sursum subulatis,
 basi parum explanatis ibique extus glandula mediana oratis; antherae
 . . . ; ovarium semisaperum. *Capsula* supera obionga, longi-
 tudine parum 3-sulcata per stylos 3-partibilis stigmatibus cohaeren-
 tibus 3-valvis, placentis a marginibus introflexis carpellorum
 . . . ac secedentibus persistentibusque, singulis utroque margine semina
 sua summo tantum fertili gerentibus. *Semina* anguste
 parum reticulata utrinque parum producta;
 naajuscula in axe albuminis carnosissimi.—*Folia* alterna
 (5-nervia) 5-nervia. *Cymae* multiflorae axillares. Species singularis
 Kachin incola.

POTTINGERIA ACUMINATA Prain; folia ovato-acuminata crasse
 glabra subtus punctata, breve petiolata, margine
 medio proximisque subaequalibus marginalibus
 minus subtus prominentibus; cymae axil-
 lares pedicellis gracilibus calyce paulo longioribus, bracteis parvulis.

Wongka 2355 Poll # Jonga 1750015 poll, longis.
 longae 1 poll, latae, pedicellis 15 poll, longis j capsu-
 longis -15 poll, latis.

of the Tribe Escalbnieae, apparently best
 which it resembles in having a similarly partite style
 in half-superior ovary but from which it differs markedly
 in the capsule so dehiscing that
 the three filiform placentas persist. The
 or Melastomaceous-like leaves and the very different
 appearance also help to give it a quite distinct facies.

Unfortunately our solitary specimen has been collected just as the
 plant was passing out of flower so that the petals and anthers have all
 dropped, and it is not therefore possible to state whether the former
 are approximate or imbricate.

COMJ3RETA0EJJ.

ARGYROPHYLLA King & Prain; arbor magna,
 foliisque utrinque dense tomento adpresso persistente
 ovatis basi rotundatis apice
 9-jugis ascendentibus subtus prominulis, petiolis apice
 5 floribus parvis, lutescentibus, spicatis, spicis in paniculis
 dispositis, bracteolis lanceolatis deciduis quam flores duplo

brevis; calyce extns glabra limbo late campanulato lobis 5 parvis
 acutis, mtus dense argyreo-villoso, tubo ovato tereti; fructus. . . .

in montibus ZACHIK nuncupatis; *Kingii mercenar.*!

Itoha pehohs -75 poll., laminis 4poll. longis 1-73 poll, latia. *Spicae*
 aingulae 8-6-4 poll, longae, paniclis 8 poll, longis, 6 poll, latis.

ItmiB very different in foliage from any species of *Terminalia* in
 Herb. C. S. C. ?^{tt} or in Herb. Zew 5 it is reported by the native collector
 'Sha, k Mokim) to be a «timber tree." The fruits sent as belonging
 to it are drupes shaped like those of *T. Oheltda* but much smaller, being
 only .5 in. long; as however there are none of them attached to leaf-
 specimens, it must remain for the moment doubtful if they really belong
 and if therefore the species is really referable to § *Gatappa*, which
 must be the case if the fruits in question be those of this tree.

CUCURBITACEAE.

14. AISOMITEA PUBIGEEA *Prain*; *foliis* breve petiolatis, pedato-5-
 foholatis, foliolis petiolulatis, membranceis ovatis, acutis subobtusis
 vel retusis, margine integris puberulis; basi, terminali excepto, parum
 obhquis, membranaceis, snpra nervis densins ceterum parcissimo
 puberulis; subtus, nervis exceptis, glabris, penninerviis, petiolulisque
 dense puberulis; cirrhis apice bifidis; *frudu* puberulo; *seminilms*
 strammeis utrinque spinuloso-rugosis.

In montibus KACHIN nuncupatis, *Kingii mercenat.*!

Alte scandens; rami graciles elongati, ramosi, paberuli sulcati.
Petwls TO: striatus -4-5 poll, longus; petioluli, terminalis .3 poll-
 la les .1 poll. 1
 n!T .7. 9% n ?ngi; foli01a ntrin1ue int <>>e viridin, 1-5-4 poll-
 longa, 75-2-5 poll. lata. *Cirrh*i graciles sulcati puberuli. *Panici*^e
 majusculae valde pluriflorae. *Peduncuh** communis latemlis termina-
 lisve, gracihs parum sulcatus dense puberulus 2-4 poll. longns,
 pedicelh capillares puberuli -4 poll, longi, bracteolae subulate. 0#*
 puberulus segmentis lanceolatis, linearibus, acutis, corolla glabrias-
 enla, segmentis ovatis acutis -1 poll, longis. *Fructus* subcylindriens
 densms velutino-puberulus, ab apice ad basin leviter attenuates, ap"<*<
 truncatus' ba,! subacutus 2-25 poll, longus, "5 poll, crassus. ft-
 atnbitu subtnangularia, margine profunde lobata basi oblique attenuate,
 3 poll' longa, -25 poll, lata, -15 poll. crMsar, ala obli qua(alt)a trans lucens
 anguste oblonga, apxce rotundata-75 poll. lon_ga, -25 poll, crassa, utrinque
 areolaclypeataspmuloso-rngosaexsculpta .

2 1 7 ?' AT Sely-pnberalons, bein^ w j ia» ti— of thftt
 rt f 7 ^ ^ ^ in ^ pedl leaves and in it<<
 s -
 328 -rugose seeds. By an oversight a numL of flowering speci-

these species have been distributed to various European Herbaria under the name *Gynostemma»pedatum*; recipients of these specimens are hereby requested to correct the name. These flowering examples were in November, 1897, the fruiting ones in January, 1898.

ARALIAOE^J.

15. PENTAPANAX STELLATUM King; scandens, novellis digitato fere crassis, cortice pallido glabro lenticellis ornato. Folia a, rachide gracile glabra basi parum dilatata; foliolis 5, jugis 2 ovatis vel ellipticis, apico abrupte acutis, basi rotundis margine integris parum recurvis; supra glaberrimis, subtus pilis longioribus kUatis dense obtectis; nervis 4-5-jugis parum incurvis innlis supra distincte impressis; petiolulis inaequilongis 6 0* Panicula terminalis basi bracteis lanceolatis us obsita, sparse ferrugineo-puberula, ramis inferioribus patentibus otis, singulis umbellas plures 15-25-florales pedunculatas ferentibus parte summa umbellas simplicis ferente. Flores late oblongi; calycis tub panulato, limbo 5-dentato, dentibus latis obtusis ; Petalis late e^ipticis. Fructus ovoideo-globosus prominenter 5-costatus, Slaber.

BURMA: niontibus Shan nuncupatis, apud Port Stedman; Kingii nar. !

foliis terminalis 1-1*5 poll., lateralium inferiorum '1-15 poll., alium summorum fere obsoletis. Panicula 12-18 poll. inferioribus 3-4 poll. Flores -1 poll. lati. Fructus -15 poll.

Pentapanax is a small genus of which hitherto only six species have been described; and of these only one has hitherto been recorded. The species now for the first time described differs from all others in its dense and very peculiar pubescence by which the undersurfaces of the leaves are clothed. The hairs are long, flexuose, and untitled.

16. HKPUPLEURUM (§Agalma) LAWANCEANUM Prain; arbor?, novellis mucronatis Puberulis. Folia diffitata foliolis 7-9, late ellipticis apice nervis 20-30. margine integris utrinque glaberrimis, crasse coriaceis; puberulis J'ugis obscuris petiolulis glabris. Panicula ramosa, ramis filis fere farinoso-puberulos umbellifeios distiictes cmit- tentibus Umbellis 12-20-floris, pedicellis aequilongis floribus parum brevioribus Galyx margine truncatus. Petala valvata, circa 7, tria- angula » int glabra extus pilis coactis dense obsecta. Stamina petalis isomera thcris oblongo-ovatis sursum parum angustatis. Fructus

truncatus apice truncatus, medio columna cylindrica (scylis connate; coronatus, 7-angulatus.

BURMA SUPERIOR : in montibus Kaclun; *Pottinger!*

Foliola 10 poll, longa, 6 poll. lata. *Panicidae* rami pedales ramuW 1*25 poll, longis, pedicellis '2 poll, longis. *Flares* -25 poll, longis, '2 V^m latis.

17. DENDROPANAX LISTERI *King*; arbuscula glabra parva, xiove^l lis cortice grosse lenticellatis ex sicco pallide brunneis. *Folia* simp^{l. cis,} tenuifer coriacea, late elliptica breviter acuminata, basi cuneata, m^m gine integra vel dentibus paucis remotis minutis irregulariter serra^{ta.} utrinque glaberrima supra hebetia; subtus reticulato-venosa, ner^{vis} secundariis distinctis; costa mediana subtus prominente a basi ve^{nas} 2 cecris crassiores fere ad apicem ascedentes saepius etiam 2 tenuiores marginales emittente, lateralibus supra laminam me^{diam} 3-4-jugis curvatis; petiolis gracillimis inaequilongis. *Panicula* ft^{xil-} laris, ramis paucis umbellatis, umbellis 4-5-floris, floribus subglo^{bosis} pedicellis gracillimis. *Galycis* tubus subglobosus limbus angus^{tus} margine minute 5-dentatus. *Fructus* sphaericus stylis brevibus^{basi} connatis apice recurvis coronatus.

In montibus DAPHLA nuncupatis, apud Torupati, 5,500 p. s^m J. *Lister*

Arbuscula 20-pedalis. *Foliorum* laminis 3'5-8 poll, longis, n^{is} 1-65-4 poll, latis; petiolis 1*5-7 poll, longis. *Flares* '15 poll. di^{am,} pedicellis '3 poll, longis. *Fructus* -2 poll. diam.

This very distinct *Dendropanax* was collected by Mr. J. k^{ister,} in whose honour it is named, when accompanying the Daphla Hil^l expedition of 1874.

CORNACEAE.

18. ALANGIUM KINGIANUM *Prain*; frutex scandens, inermis, n^{ollis} puberulis; *folia* membranacea, oblongo-ovata, basi truncato-cune^{ata} apice rotundato demum breviter acuminata utrinque nervis puo^{erulis} ceterum punctulata, basi sub-trinervia nervo mediano robs^{tioro} nervos ascendentes 5-6-jugos emittente; *flores* in cymis laxis axil^{laribus} foliis multo brevioribus dispositi, pedunculis pedicellisque puber^{ulis} *cahyce* dense puberulo breviter 7-dentato, *petalis* lutescentibus o^{xtus} puberulis saepissime 7, anguste linearibus apice subacutis; *stamifl*^{ibus} 14, filamentis brevissimis pubescentibus, antheris linearibus; »^{nis} parcissime adpresse puberulis, pariim compressis, longitudinaht^{or} 14-
decim lincatis basi roundatis apice subacutis.

In montibus KACIIN nuncupates', apud Agata Kedan, etc., & ⁱⁱ *wreewnr.* /

Folia 4-6 poll, longa, 1-5-2-5 poll, lata, petiolis '25 poll- longis.
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from the North-Eastern Frontiers of India.

flfMnn. pedunculiB *.-.» P^{oll}^ JJJ is 1 poll. latis 8-12-floris,
pedicellis-25 poll, longis. m& . . .
poll, tang*, ^5 poll. W :- . . . before . . . r . . . ranted in Herb. C a » . . .

cule petiolatiB, laminis ovatos t p ^ ^ . ^ subtus prasinis, un . . .
inten . . .
glaberrimis, nervis 6-8-jugis subtus . . . ribus parum ascendenti-
bus; thyrsus UXUB dichotomy pedunculo ramisque glabris; flores
ignoti ; /r«ctt« a guste . . . as.
In montibus KACHIN; K: . . . mercenar. !
Folia petiolis .75 poll. longis, laminis 4 poll. longis, 1.75-2 poll.
latis; pedunculis 2.5 poll. longis, thyrsis 2-2.5 poll. latis; fructus calycis
limbo 4-dentato coronatus, .6 poll. longus, .3 poll. crassus.
A wry distiuct species.

RUBUCEJ!

20. OPHIORRHIZA LAWRANCEANA King & Prain; caulis brevis basi
radicans adscendens vel 0; folia elliptico-oblonga, apice acuta basi
cuneata, petiolis brevibus parce puberulis, laminis nervis subtus parce
puberulis, ceterum utrinque glaberrimis, stipulis e basi trianguli fili-
formibus, cymae longe pedunculatae . . . stae glabrae, bracteolis spatu-
latis obtasis glabris persistentibus, . . . bus brevibus triangulis,
corolla brevis tubo cylindrico, limbo . . . capsula glabra.

In montibus Kaobfnnnc . . . ; mercenar.
Mi. 1.25-3.5 p * lon ^ ^ I O gis. Corolla . . . Cymae 3-5
poll. latae, ped^ouis grac^as 3 poll-
tubo angusta . . . Himalaya in
e bractea,

Very si
size and habit, and no doubt related . . .
however different and the corollas are smaller and much narrower.

21. PAEDERIA CEYDASIANA Prain; volubilis corolla excepta omnino
glaberrima; . . . annosita petiolata ovata basi truncata apice acuta;
flores . . . terminalibusque laxis per
ibo

paribus distentibus a u p * * > « » ^ fc extns pubevpla tuhui
camp
dense tomento Ba; > « cilw ton- calycis
In .ontibus KICB.s nuncupate; . . . ft* . . . petiolis 1-1.25 p ft
lata. . . mis

long

singulis terminalibus -5-75 poll, latk *Corolla* '5 poll, longa. *Fractus*
 •25 poll, tongas, '3 poll, latus.

This very distinct species belongs to the group characterised by the fruits uncompressed and differs very markedly from other species of that group in having the fruits egg-shaped, narrow upwards from the middle, and not subglobose rounded at the top as *P. tomentosa*. From *P. Unearis*, the other Indian species referred to the group, it differs much in foliage—its general facies, except for fruit, being very much that of the common *P. foetida*,

VAOOINIACEE.

22. AOAPETES POTTINGERI *Train*; frutex epiphytica, ramis adpressis puberulis et pilis rigide setaceis patentibus ferrugineis simulaculis. *Folia* sessilia ovato-lanceolata a basi fere rotundata sensim ad apicem longius acuminatam attenuata, margine integra, coriacea, uvida glabra, nervis 8-10-jugis supra distinctioribus. *Inflorantia* corymbosa ramiflora pedunculo pubescenti bracteis rigidis cincto, pedicellis gradibus pubescentibus basi bracteis, bracteis majusculis ovato-lanceolatis rigidis striato-reticulatis margine puberulo excepto glabris. *Calyx* tubo globoso cum apice pedicelli parum ampliati articulato extus pilis longis fulvis setaceis apice glandulosis patentibus obsito, limbo campanulato margine 5-dentato prostrato reticulato, dentibus triangulis quam partem limbi connatis brevioribus, intus glabro extus pilis longis sparse pubescente. *Corolla* tubulosa recta medio parum amplicata sub limbo breviter 5-loba lobis late triangulis subobtusis parum contracta, extus parce pilis flaccidis pubescente, lobis viridibus ceterum rubris nee lineis notatis. *Stamina* 10, epigyna, libera, filamentis antillarum fere acquantibus, antherisque glabris; antheram tubulis corollae limbum vix attingentibus, dorso 2-calcaratis. *Ovarium* 5-lobulatum filiformi apice brevissime 5-lobulato ovulis numerosis.

In montibus KACHIN nuncupatis, 4100 p. s. m., *Pottinger*!

Folia 5-7 poll, longa 1'5-2'25 poll. lata. *Corymbis* paniculatis 1'5 poll, longis, pedunculis '2 poll., pedicellis *5 poll, longis, bracteis 2 poll, longis. *Ocalycis* tubo 1 poll., limbo -35 poll, longo, dentibus '15 poll, longis. *Corolla* '65 poll, longa.

This remarkably distinct species is separable from all hitherto described *Agajntes* by its large bracts and its large calyx-limb, the teeth of which, are not partite to the disk as in our other species. It is taken therefore as the type of a distinct section (§ *Holocalyx*) distinguished as follows from the other sections defined in the

Plantarum ii. 571:—

§UOLOCALI. *Coivilla clongita recta puvutu reatuvixiu iuvr*

5-[^]da Inj*
[^]ereCti S* Stamina recta antherae dorso calcaratae. Bractee
 majusculae, calycis Umbus in dentibus 5 prorsus hand solutus.

DESMOGYNE KING & PRAIN.

Calycis tubus teres pedicelli apice ampliato crateriformi involutus
 subglobosus J limbus magnopere ampliatu late campanulatus, margine
 integer, Pemstrens< Gorolla tubulosa anguste infundibularis, elongata,
 tubo tero¹⁶ reCto breVe 5, lobO) lobis erectis. Stamina 30, epigyna,
 corolla aequillonS^a filamentis glabris basi inter se et a tubo corollae
 liberis; anther[^]e elongatae rotatae liberae dorso muticae tubulis connatis
 tennibus Btncis membr[^] anaceis, loculis extus muriculatis. Ovarium
 5-loculare, styli filiformis sti[^]mate lobulato; ovula in loculis singulis
[^] Sa pla Centis & II S[^]0 interiori adnatis.—Frutices epiphytici, foliis
 altern[^] 1S pers; 8 tentibus [^]reviter petiolatis coriaceis integris. Species
 singula, niontium Indiae transgangeticae incola.

23.

D[^]AMoaTNE NERIIFOLU King & Tm{n>* frntex epiphytica,
 ramis glabris S[^]racilioribus. Folia alterna oblongo-lanceolata apice longe
 caudato-^aCumi nata basi rotundata breve petiolata margine integra, crasse
 coriacea ne r[^]is mediano subtus P[^]rominente supra impresso excepto
 obscuris, ... [^]orescentia co 7 mbosa pedicellis versus apicem pedunculi
 sursum InCrassati in axillis bractearum triangularum approximatis;
 pedicelli, *ⁿTMT incrassatis apice cu[^]P[^]l[^]bus. Calycis tubus globosus
 in fundo [^]icay[^]is articillatus eo< lue involu<TM, limbus inflatus late cam-
 panulatus Tn*rgme inte[^]er P[^]TOr[^]us prominenter reticulatus. Corolla
 elongata l[^]ecta infundibillifoTMis 5-loba, lobis brevibus triangularibus.
 Stamina 1-, ? [^] hbera filamentis brevibus antheris elongatis erectis-
 apicibus corollae umbum at[^]id[^]entibBS, dorso [^]is. Ovarium 5-locu-
 lare, stylo filif[^]e apice bre r 5-lobulato; ovulis numerosis. Fructus
 ovatus calycis hmbo persistente coronatus.

BURMA: in montibus Chin etiam in montibus Kachin, Kingii
 mercenar. !

Folia 4-6 poll. longa 7-9 poll. lata; petiolis 2 poll. Pedunculi
 axillares ad 25 poll, usque longi, bracteis triangularibus 1 poll, longis
 pedicellis 1 2 poll.; calycis tubo 15 poll, longo, limbo 3 poll, longo
 latoque. Corollae tubo 1-5 poll, longo, limbo 5 poll, diam., lobis < 2 poll.
 longis. Fructus 4 poll, longus, 35 poll. diam.

ft e .. Jr⁷ [^]Stinct Species of the group of y*cciniaceae that constitutes
 all Pentapt[^] [^]O [^]M G. Don., and Pentapterygium Klotzsch From
 ridged - d <W> a it differs in having the calyx neither winged nor
 tube it*[^]T# while agreeiDg with [^]JP[^]e[^] in having a smooth calyx
 the cal i⁷ fTOM an, the known species of that genus in having
 jx-limb large, entire and widely campanulate, and, further,

in having the calyx tube enveloped by the expanded cupular apex of the pedicel. With reference to this last character the name *Desmogynix* is proposed, a bandage; yw# has been applied to the plant. We feel inclined to think that *Agapetes* and *Pentapterygium*, which are distinguished solely by the absence from the former, the presence in the latter, of ribs or wings to the calyx, are hardly separable as genera. But these two could be united our plant would then be the type of a section *Desmogyne* within this enlarged *Agapetes*. But seeing that in the three most authoritative treatises on the genera of plants—the *Genera Plantarum*, the *Sistoire des Places*, and the *Natürlichm Pflanzenfamien*—Messrs Bentham and Hooker, Baillon, and Drude have considered it necessary to keep *Pentapterygium* apart from *Agapetes*, we are constrained to give our *Desmogyne*, at least for the present, the rank of a genus; it differs more markedly from either *Agapetes* or *Pentapterygium* than these two differ from each other. The undivided calyx-limb, at first sight a more jagged feature than that and the arrangement at the apex of the pedicel is not really so important a difference as it appears; the species immediately preceding this (*Agapetes Pottingeri* Prain) stands intermediate as regards calyx-limb between this and the other *Agapetes* since the limb though 5-lobed at the margin is there also campanulate and gamophyllous below.

Our collector who has examined and kindly compared one of our specimens at Kew agrees with us in thinking that so long as *Pentapterygium* is kept apart from *Agapetes* our plant had better receive generic rank. If *Pentapterygium* could only be reduced to *Agapetes* the present species would probably have to be included in this enlarged genus as *Agapetes Desmogyne* King & Prain.

PBIMULACEÆ.

84. *LYSIMACHIA BIVALVIS* Wall, in &*. *m. f. Carey A Watt.*, 27 VAR. *grandifolia* Prain; *folia* 6 poll, longa, 2-25 poll. *M* 5 *pedwnath* 2 poll, longi.

In montibus KACHIN, apud Nepochawng 2,500 p. s. m., *Pottinger!*

This may prove, when more completely represented, to be a distinct species.

SOLANACEÆ.

25. *SOLANUM FEROX* Linn. 8p. P U d. ii. 267 VA*. *iDermis* Pr«*» 5 omnino nisi aculeis absentibus cum *S. ferox* *In montibus KACHIN nuncupatis, Ringii mercenar.!* *T* lecto, te is "M olma Vi... «TM»* '«*»» Therein not a character whereby the plant can be separated from *S. ferox* except

the c... absence of any trace of prickles whether on leaves or
sto... and in the less numerous needle-like hairs on the fruits.

It is well-known that many forms of *S. Melongena* under cultivation
fely lose their armature; it is interesting to find that the same
apparently happen with a wild species like *S. ferox* when growing
Weed in the rich soil that characterises the vicinity of an Indian
tillage.

GESNERACEÆ.

26. AÆSCHYNANTHUS GRANDIPLORA Spreng. *Syst. Veg. iv.* 238 VAR.
Prain; floribus 2*25 poll, longis, ceterum typi.

montibus KACHIN, *Kingii mercenar.!*

27. AÆSCHYNANTHUS MICRANTHA Clarke in *Flor. Brit. Ind. iv.* 340
ottingeri Train; capsulis 10-pollicaribus, ceterum omnino typi.

montibus KACHIN, *Kingii mercenar.!*

Quite possibly both these *Aeschynanthi—ol* which the first is only
** flower, the second only in fruit—may prove when fully re-
*ted to deserve specific rank.

28. AÆSCHYNANTHUS PUSILLA Train; rami elongati gracillimi, sparse
ibus prorsus radicanes, foliis ternatis parvis ovatis apice
basiscunatis, '3 poll, longis #2 poll, latis ntrinque pilis albidis

villosis, nervis obscuris, margine integris petiolis dis-
(15' villosis; floribus paucis terminalibus et in
s, ad nodos singulis, pedicellis gracilibus, '2 poll.

denso; calyce 5-partito, segmentis lanceolatis tuboque
npanulato pilis patentibus dense villosis; corolla extus
pallide flava limbum versus viridescente, lobis ipsis

purpurascens, tubo 1 PoW. longo dimidio inferiori
cylindrico, dimidio superiore anguste infundibuliformi,
P°U. lato; filamentis inclusis filiformibus glabris; capsula adhuc

montibus KACHIN nuncupatis; *Kingii mercenar.!*

This graceful little species may be tentatively referred to the sec-
-*Haplotriehiun*, its general facies indicating that it is probably
related to *Aeschynanthus gracilis*; till fruiting specimens are ob-

however, its precise position must remain problemetical.

29. AÆSYMOCARPUS ELATIOR Train; suffrutescens; rami juniores
diversentibus rufescentes demum glabrati; folia ovato-lanceolata
cuneata apice acuminata margine minute serrata, petiolata, petiolis

pubescentibus, laminis supra parce adpresso puberulis subtus prae-
pubescentibus: cymae pauciflorae axillares pedunculis
elongatis puberulis; bractee lanceolatae; pedicelli calyce

param longiores saepius singuli; *calyx* campanulatus ad medium usque
 fiasus denfibus ovato-acutis tubum aequantibus; *corolla* tubulosa
 recta extus parcissime puberula, subsymmetrica, pallide *pu*^{ur};
capsula in pedicello erecta.

In montibus KACHIN, apud Sim, 5,000 p. s. m., prope rivulis;
mercenar.

Foliorum laminis 3. poll, longis, 125-15 poll, latis, petiolis '75 p[^]
 longis; pedunculis 1*5 poll, longis saepius 3-floris, nonnanq[^]
 (floribus lateralibus geminis) 5-floris; pedicellis'4 poll, longis; *ca*¹⁵
 *25 poll, longo; *corolla* 12 poll, longa; *capsula* 1-125 poll, longa
 poll. lata.

A very distinct species, in habit most resembling *V. corchonj*
 Wall., from Penang and Malacca.

ACANTHACE2E.

30. RHINACANTHUS CALCARATUS *Nees in Wall. PI As. Ear** i>; 10⁹
 VAR. maxima *Prain*; *foliis* utrinque parcissime puberulis, *panicula*
 condensata; *corollae* tubo 1*5 poll, tongo; *capsula* 2 poll, longa.

In montibus KACHIN, *Kingii mercenar.*

This will probably have to be considered a distinct species, ** > ^*
acanthus maximns, when full material of the original species is ob
 as yet the fruit of *Nees*' plant has not been collected. They *resent*
 plant has leaves that are exactly like those of the type in size *and*
 texture; they only differ *in* being faintly puberulous on both BI *d s*
 those of *Nees*' plant being glabrous; its calyx and corolla are exac
 like those of *Wallich's PL As. Bar. 1113* except that they are distinct y
 larger.

HAEMODORACEJ).

31. OPHIOPCGON CORDYLINOIDBS *Prain*; caule rigide erectiuscu
 crasso, nodis nee radicante, vaginibus ovatis viridibns margin[^] late
 scariosis mox deciduis suffulco, *foliis* late lanceolatis acuminatis 15-17-
 nervis, petiolis angustis brevibus basi vaginis scariosis expansis, **ca*^F
 quam folia fere dimidio brevioribus, bracteis scariosis, pedicel
 longioribus, *floribus* fasciculatis, albidis, quam pedicellos brevior
 segmentis ovato-oblongis, antheris lanceolatis filamentis breviss
 stylo filiformi; *fructu* orbiculari.

In montibus KACHIN, apud Namli, 2000 p. s. m., *Pottinger!* K**9
mercenar.

Caulispenna cygni crassus, foliis 8-12 poll, longis, '75-1 poll-^{1 1/2}
 petiolis vix 1 poll, longis. *Racemi* 3-4poll, longi, bracteis '3 poll-[^] P
 pedicellis 25 poll, longis, *perianthio* *2 poll, longo, '3 poll, lato; *fructu*
 *2 poll. diam.

but A very distinct species with an elongated stem as in *O. dracaenoides*,
 Without roots at the nodes whence arise¹ the tufts of leaves; the
 ginal sheaths are exactly as in *C. dracaenoides* but the leaves proper
 are longer and narrower and have shorter petioles. The flowers are
 much smaller; the fruits are con-
 siderably smaller.

LILIACEAE.

32. DISPORUM PULLUM *Salisb. Trans. Hort. Soc. i. 330.* VAR. oblan-
Prain; foliis oblan-
 ceolatis, acuminatis, 8 poll, longis 25 poll.
 fasciculis circa 15-floris, pedicellis 25 poll, longis, fructibus ovatis
 sub-2 poll. longis.

In montibus KACHIN, apud Lammuk, *Pottinger!*
 This is unfortunately only represented by one specimen which is
 without flowers. It is obviously most nearly related to *D. pullum* of
 which it is for the moment treated as a variety, though there is hardly
 room for doubt that when more fully represented it must be considered
 a distinct species.

COMMBLYNACEAE.

VAR. STREPTOLIRION VOLUBILE *Edgew. Trans. Linn. Soc. 90 t. 2.*
 setosa "Brain; caulibus, petiolis, foliorum marginibus, pedicellis,
 bracteis marginibus, pilis fuscis rigidioribus densius setosis;
 caulis teretibus

In montibus KACHIN; *Kingii mercenar. I*
 The setose stems, petioles and leaf margins give this plant a very
 distinct appearance, but it cannot be separated by any other character
 from the typical *S. volubile*, which is likewise sent by the same collector
 and it will probably be found unnecessary to
 regard this more than varietal rank.

AROIDEAE.

04. TYPHONIUM INOPINATUM *Train; foliorum* petiolis quam lamina
 pro longioribus; lamina ovata apice acuta base sinu latiore cordata;
 tubo petioli partem vaginalem fere aequante; *spathae* tubo sub-
 orbiculari quam lamina prorsus suberecta sensim acuminata sexties
 brevior; tubo utrinque viridi, limbo viridi extus basi lineatim obscure
 purpurascens intus basi lineis sursum maculis purpureis notato; in-
 flor-
 tecentia foeminea fertili quam mascula multo brevior, pistillodiis
 paucis simplicibus vel bifurcatis parum recurvis; spadicis appendice
 tero-
 anguata conoidea vix stipitata reliquam spadicis partem parum
 cetera.

In BURMA superiore prope Myitkyina, *Kingii mercenar.!*

Foliorum petioli 1.5-2 dm., * > * * > « * » • * * -5 cm., lamina aequae 4-5 cm. longus, s S t J ^ sin-aque 2 ^ ^ * * " • » * » 4-5 cm. longus, t i n t . T ^ f a t U S ^ W 8 u b a u t . * * K m b u s 9-10 cm. cylindrica pal. T d o r a l 1 cm. longa 4.5 cm. lata, antherarum thecae rimis porosis apertae 5 cm. lata, p . i l l o d . - a s p n r p U r e i 8 m e d i o ^ W 8 a p i o e viridescentibus explanatis f T . o T I n f l o r e ^ » « a t o t a 8 c m l o n g a , p a r t e s t e r i l i 5 c m . n t a S 2 4 f * W C a t M T i r i d i s P a U i d e m b r o - s u f f u u s o v a l i s , * cm. longus, 4 cm. diam. the fl t t S r ^ S f ! ^ W M * * * noticed » Oct. 1895, iaoneof sp B o t a * G a r e n , i n w h i c h a p p e ^

std n of 5 e T l n e d b y ^ H , E , B r o W D , o f t t e K e w s t a f f , a v e r y a b l e student of * * * . * . Brown agreed with us in thinking it new. No light n l ? t h e W i l l i a m s , a t t h e t i m e o f i t s « - b e i n g n o t i c e d , o n i t s original ha s i n t r o d u c t i o n A t a d a p p a r e n t l y n o t b e e n r e c o r d e d , s e e i n g t h a t t h e s e n t l y f u n d a m e n t a l l o o k e d * * i n s t e a d o f p a r i t y

The communication of specimens from last to definitely settle the

of Uffi 7!, > * ^ . . . j i s n o w o r t h y t h a t t h e c o m m o n e s t s i x m

evidently a plant introduced by H. E. Brown (1793-1845) (Ko'Whs' - cum-bency as Superintendent in Bengal) did not collect it learn that

but of these where it is abundant. Next to it is T. impii - species that during Roxburgh's superintendency was accidentally introduced from the Moluccas, and that he has described as Arum trilobatum in Fkralndica, iii. 505, but that is not the Arum trilobatum of L t T b Z O X u . t f ? P o i n t o e p s , t h o ^ h U w a s i n c l u d e d i n L T M * * * 8 « *

true of th (Bat.) with Arum epiac floxb. wher J Z ' t ' ^ m e n a n o t h e r s i d e n t i f y R u m p h i u s ' ^ ^ a ^ ' ; ; ^ ^ 8 P l a n t i s t h e s a m e a s u s u a l t o g i v e t h e n a m e T y p h o r i u J ^ ^ v . * . 1 J o f r , ^ I t i s t h e a u t h o r i t y o f S c h o t t , f , i f S i f t * R o x b u r g s p a n t , o n f a c t t h a t S c h o t t g i v e s a % o f t h e I . J . S . 4 ^ 6 0 ; 1 0 1 1 * o t h i s i n f o r m a t i o n b o n a m e s T . U o x b u r g h v

from the North-Eastern Frontiers of India.

and which he takes to be Roxburgh's one, but which differs altogether from Roxburgh's in habit, (S) ! S of spathe, nature of pistil, long as vaginal portion of «» and female portions of inflorescence and peduncle (twice instead of half as long as vaginal portion of «» and male portions of inflorescence and peduncle) Thig ^den- space between male inflorescence and female portions of inflorescence has kft a very

difficult is the more intricate since a drawing of the plant has been copied by Wight in 1803, and since Schott himself has expressed a doubt whether the plant is the same as the Roxburghian one.

Roxburgh identified his plant as *Typhonium* (Saunders' Ref. Bot. t. 283) but the tip of the spathe does not twist in the figure given by Roxburgh. The tip of the spathe does not twist in the figure given by Rumphius. The tip of the spathe does not twist in the figure given by Rumphius. The tip of the spathe does not twist in the figure given by Rumphius.

chief objection to Wight's plant being much too long. What makes matters more complicated is that yet another species of *Typhonium* was described by Schott in the Botanic Garden, and which he called *T. Schottii*.

to a distinct plant, has been described by Schott in the Botanic Garden, and which he called *T. Schottii*. The description of *T. Schottii* is based on a drawing of the plant which he gave to Schott. The description of *T. Schottii* is based on a drawing of the plant which he gave to Schott.

Prodr. III (1830) part of 1; Saunders. and to cite Wight as a new species, from the original in terms of 17 (excl. descript.). The coloration of the spathe is that of *T. Schottii*, Schott's plant is based on a drawing of the plant which he gave to Schott.

the description of *T. Schottii* is based on a drawing of the plant which he gave to Schott. The description of *T. Schottii* is based on a drawing of the plant which he gave to Schott. The description of *T. Schottii* is based on a drawing of the plant which he gave to Schott.

T. cuspidatum BL, and curiously enough this happens to be much the rarest of the five that are to be found within the limits of the Gardens. We have been unable to find it noted that the otherwise excellent fig^{1*6} which Blume gives of *T. cuspidatum* makes the curious mistake of reversing the position of the lower pistillodia. These are cymbiform organ⁸ with the concavity directed upwards in the natural Btate; in Blame & figure the concavity is made to look downwards.

Before leaving this subject it may be pointed out that thong¹ Roxburgh has cited Loureiro's *Arum tribbatum* as equivalent to WB *A. orixense*, this is by no means clearly the case. The pistillodia of *A. orkense* (the true *A. trilobatum*) are, as Roxburgh describes them, yellow; those of *A. trilobatum* Loureiro, are described, on the other hand, as red. The truth ia that the genus *Typhonium* requires more careful and extended study, from living plants, than it has yet received.

35. TYPHONIUM LISTERI Prain; foliorum petiolis quam lann^{fil} dimidiolongioribus; lamina pedatisecta 5-foliolata, segmentis median^{**} sessili reliquis per paria brevo petiolulatis omnibus angnste ova^{ti} basi cuneatis apice sensim acuminatis; pedunculo purpureo brevissiwo bracteis cataphyllariis obtecto; spathae tubo subcylindrico qu^m spatha subito refracta quadruplo breviora; tubo extus laete Wjcn¹ intus lutescenti, limbo extus margine purpurea excepta laete vine¹ intus purpurascente; inflorescentia foeminea fertili quam mascul^{*} parum tantum breviora, pistillodiis paucioribns majusculis lign^{1*} deflexis purpureis; spadicis appendice tereti parum stipitata basi plus minus obliqua concolore lactea, abrupte refracta et spathae Hmbo involuta reliquam spadicis partem triplo longiore.

Inprov. CHITTAGONG; Lister! in ASSAM; Watt!

Foliorum petioli 25-3 dm. longi, pars vaginalis 1*5 cm., cata-phyllis spathaceis 3-7 cm. longis; laminae segmentis 1*4 dm. long^{is}» 6 cm. latis. Pedunculus vix 1 cm. longus, spathae tubus 4 cm* longn[>] 2 cm. latus, lirabus angulo angulnm rectum parum excedente refracts 1*4 dm. longus, 7 cm. latus apice acutus. Inflorescentia mascula cyñ^{*} drica 1*7 cm. longa, 49 cm. lata, pars foeminea conica 1 cm. longa, basi 1*5 cm. lata; parte sterili 1*2 dm. longa, 1*2 cm. lata.

A very distinct species.

36. TYPHONIUM POTTINGBBI Prain; foliorum petiolis qnam lamina duplo longioribus, lamina profunde tripartita partitionibus subaeq^{fil} longis intermedia oblongo-elliptica acufca, lateralibus oblongo-lanceolatis» lobo triplo breviora oblongo-obtuso subretuso auctis; pedunculo q«^{aTn} petioli pars vaginalis duplo breviora; epathae tubo ovato tel oblong⁰ quam lamina imo terfcio ovata erecta sursum rcurva dc sensim Pny^e acuminato-caudata octies breviora; tubo extus viridi intus rubescen^e,

limb. basi tantum intus rubescente supra puniceo-maculata extus con-
color. e pallide viridi; inflorescentia foeminea fertili quam mascula multo
bre viore, pistillodiis numerosissimis varie flexis; spadicis appendice
ter. anguste conoidea breviter stipitata reliquam spadicis partem
ma gnopere excedente.

In antibus KACHIN, prope Myitkyina, Kingii mercenar.!
xoliorum petioli 2-2*5 dm., pars vaginalis 2*5-3 cm., laminae parti-
tion es '8-1*2 dm. longae '75-1 dm. latae, lobi lateralim basales 4-6
cm. longi, 3-4 cm. lati. Pedunculus 1-15 cm. longus; spathae tubus
lata lon ^us> ^ cm. ^a^us Hmbi pars triens inferior 7 cm. longa, 9 cm.
pars summa caudata reflexa basi 3*5 cm. lata, 1*4 dm. longa, sen-
sim apice longe acuminata attenuata. Inflorescentia mascula cylindrica
rubra ^ cm. longa '7 cm. lata antherarum thecae rimis porosis apertae;
pars foeminea alba ^5 cm. longa, '85 cm. lata, pistillodiis albis expla-
na. a 1.2 ^ ^ cm> ^on^Si Inflorescentia tota 4 dm, longa, appendice
afc/v K 16 dm. ionga-

Edition to the *torgingAroideas*, an undescribed *Amorphophallus*,
wii has been included in a *List of Kachin Plants*, published in the
Recor as of the *Botanical Survey of India* as *A. Cruddasianus*, should be
here allud(* *o« Complete material has been sent by our Garden
Coll -ecto r> ^U^ *or *^e momen* we prefer to withhold a detailed descrip-
tin n t, l living flowers are available, when an accurate account of the
color t On Can ^e ^yen* ^nr collector has sent also a number of living
tuber s> but ^u, in g the past season these have sent up leaves only. The
tuber s alone, however, furnish characters that are sufficiently
d: Ph & h h 7 . i. m ^ ace o ^ ^ G * n & ova ^ or depressed, as in other *Amor-*
Parsni il hlfcherto described, these in *A. Oruddasianus* are lojgg and
P, sha Ped, 6^10 in. long, 2-3 in. across the top.



An account of
Corydalis persica Cham, et Schlecht

with remarks on certain allied species of

Corydalis Vent.

By

David PHILLIPS

With plate VI.

Among those species of the genus that, for my own convenience, shall here continue to term *Corydalis* Vent.¹, none are more difficult to differentiate satisfactorily than the ones that belong to the section which M. Boissier², using a name employed generically by Bernhardi^{*}, has termed *Bulbocapnos* but which it is perhaps better to follow Irmisch⁴ in denominating *gallinaceus*. This section includes, or should include, all species with a solid tuber-like corm and with normally, though not by any means universally, a solitary terminal raceme. Within this section probably most trouble has been experienced in separating satisfactorily those species that have opposite cauline leaves and have no leaf-scale on the stem between the corm and the foliage; these species constitute a group of forms to which we may either apply the term *Leonticoides*. Use of the name as a sectional epithet by M. de Candolle⁵ or the name *Cryptoceras*,

¹ *Choix* **49** (1803); *DC. Flor. Fr.* IV, 636 (1805).

² *Flor. Or.* I, 126 (1867).

⁴ *Linnaea* VIII, 469 (1833).

⁶ *Abf. d. Naturforsch. Gesellschaft Halle* (1862).

⁵ *V. ffy.* **II**, 114 (1821).

used in a generic sense by Schott and Kotschy'. The group is one that is almost entirely confined to the Oriental and Central Asian regions though one of the species extends some considerable distance along the North-Western Himalaya.

It may be considered doubtful how far it is advisable to employ either of these terms. It is true that H. de Candolle's section includes two of the species that constitute the group, but it has to be borne in mind that the establishment of *Leonticoides* as a section depended on a misinterpretation of the structural characters of the plants that compose it, and it should be remembered too that M. de Candolle placed in his section *Capntes* the only plant that belongs to this group (*C. rutefolia*) of which he did not fully know the structure. It may also be remarked in passing that the authors so careful and so eminent as Hooker and Thomson* have reduced both these species of the *Leonticoides* section to this particular plant, considering one (*C. oppositifolia*) to be identical with, and the other (*C. verticillaris*) to be only a variety of *C. rutefolia*. Another authority of equal rank, M. Boissier has kept *C. verticillaris* apart as a species but has followed Sir J. Hooker and Dr Thomson in their treatment of *C. oppositifolia*.

The account that Schott and Kotschy have given of their proposed genus *Cryptoceras* is, on the other hand, very accurate and complete so far as the forms known to them are concerned, and, with the single exception perhaps of *C. darwasica*, it applies very well to all those that have been recorded since their description was written. Nevertheless it is difficult to see on what characters they relied in separating their proposed genus from *Corydalis*. The salient characters in their diagnosis are a. the so-called tuber-like conn — but this is common to every member of the section *Pesgallinaceus*; b. the opposite stem leaves—but this character recurs in species of other sections; c. the neclariform process in front of the anther-staminal phalanx — but this character occurs in species of other sections and often to a more marked extent than in any species of the *Cryptoceras* group. Their description of the lower lip «inferne saccalo-gibbum, apice tandem reflexum» is very characteristic of most of the species of the group yet *C. diphylla*, which has the lower lip bulged below, does not have it reflexed above, and *C. darwasica* neither has the lower lip reflexed above

¹ *Oestr. Uot. Wockenbl.* IV, 121 (1854).

* *Fhr. Ind.* I, 261 (1855).

⁹ *Flor. Or.* I. 126, 127 (1867).

nor bulged below. In this case too, the character is one that is by no means confined to the *Leonticoides-Cryptoceras* group. In any case it seems hardly worth while to provide this group with a distinctive name, for it is possible to say that it should be separated from the species with a solid tuber and a solitary terminal raceme that have no leaf-scale but have the stem-leaves alternate. Not only do we find the leaves at times opposite only in *C. rutefolia*, which is a member of this group; we find occasionally that the leaves are opposite in species like *C. parnassica*, which normally have alternate leaves.

When these preliminary remarks I shall now endeavour to indicate characters that may render possible the identification of the leading forms included in the group, but it should be understood that the review now offered does not profess to be in any way final. I have had no opportunity of examining the actual specimens on which Schott and Kolschy have based no fewer than four species that M. Boissier has felt justified in regarding as forms of the same plant; my chief object in presenting this partial indication of the difficulties connected with the diagnosis of these forms is to induce other workers, more favourably situated than myself as regards access to authentic material, to undertake an authoritative revision of this interesting group. It may be mentioned moreover that this partial revision is merely the by-product of an enquiry into the characters, relationships and identity of *Corydalis persica*, a species that had hitherto been incompletely understood. Thanks to much kindness on the part of the late Dr Batalin of St. Petersburg, M. Barbey and M. Autran in St. Petersburg, the Boissier, and the Berlin Herbaria respectively, my disposal and have helped me with advice, the difficulties regarding *C. persica* have been, in my opinion, completely removed. I would here wish to express my very grateful acknowledgments for the assistance so generously given.

My account of the forms dealt with will be more intelligible. I have been aided by drawings of the flower and bract of each; these drawings have been made as accurately as possible to one scale (X 2) in order that no confusion of ideas may be induced when comparing one with another.

CORYDALIS Vent. Choix 19 (1803).

DC. Flor. 636 (1806); Boiss. Fl. Or. I, 126 (1867).

§ PES GALLINACEUS Irmisch. (BULBOCAPNOS *Boiss.*, pro sectione; *Bernh.*, sp. *C. cava* excepta, pro genere); radix tuberosa, racemi florum ternna^{les} vel rarius eliam axillares, slophiolum digitiforme.

Subsect. *Leonticoides* DC. Syst. Veg. II, 114 (pro sectione) vel *Cryptoceras* Schott & Kotschy, Oestr. Bot. Wochenbl. IV, 121 (pro genere); luberosae, tuberis solidis hypogaeis ovatis vel orbicularibus apice cau^{le} singulos vel plures simplices sub terra plus minus protractos ibiq^{ue} spongiolis radcinis densius oblectos emittentibus; caulibus tandem ter^m assurgentibus ibique erectis glabris esquamatis, folia 3-secta bina nu^{ne} manifeste 2 opposita nunc petiolis propriis magnopere abbreviatis petio^{li-} lisque elongatis spurie 6 verticillata exserentibus, supra folios in raceme paucifloris continuatis ibique saepissime simplicibus nonnunquam tain^{en} (praesertim in *C. diphylla*, *C. macrocentra*, *C. Sewerzovii* et *C. darwasica*) racemo laterali axillari. rarius racemis 2 axillaribus, ornatis; brae^{telis} integris vel rarissime (*C. macrocentra*) flabellato-incisis; petalis exten^{to} bus carinatis vel rarissime (*C. darwasica*) cristatis, postico varie calcar^a antico (*C. darwasica* excepta) inferne saccalo-gibbo apice (*C. darwasica* et *C. diphylla* exceptis) tandem reflexo; capsulis ovatis pedicello fruce^{ti-} fero recurvo vel rarius (*C. diphylla*, *C. Ledebonriana*) horizontali^l patente nutantibus.

Species ad 13, regionis orientalis incolae.

Clavis specierum.

- Labiis margine valde explanatis dorso cristatis. 1. *G. darwasica*.
 Labiis inargine parum vel vix explanatis, dorso carinatis sed non cristatis .
 Floribus sigmoideis; i. e., calcar hasi adscendente, tunc apice incurvo .
 Foliis distincte petiolatis, calcar basi late conico, petalis latera^{libus} paulo longiore; capsulis patentibus. 2. *C. diptylla*.
 Foliis hreve petiolatis vel sessilibus; capsulis nutantibus :
 Foliorum segmentis omnibus longe petiolulatis 2-pinnatis^{calcare} calcar basi conico petalis laterali bus triente longiore. .
 3. *C. GrW.*
 Foliorum segmentis omnibus distincte petiolulatis latera^{libus}

(3)

3-partitis mediano 3-secto; calcare basi conico petalis lateralibus subduplo longiore; petalis roseis exterioribus apice obtusis.

4. *C. modes I a.*

Foliorum segmentis lateralibus breve, mediano longiuscule petiolulatis. lateralibus 3-partitis, mediano 3-secto; calcare petalis lateralibus duplo longiore; petalis luteis exterioribus apice acutis. 5. *C. Sewerzovii.*

Floribus rectis; *i. e.* calcare basi baud adscendente; foliis omnibus breve petiolatis vel sessilibus :

Foliorum segmentis 3-fidis vel 3-sectis, lobis ovatis; calcare pelalis lateralibus quinta parte tantum longiore; labio postico apice truncato. 6. *C. rutw folia.*

Foliorum segmentis 3-4-pinnatis, lobis Jineari-oblongis; calcare petalis lateralibus triente longiore; labio postico apice acuto.

7. *C. verlicillan's.*

*loribus falcatis; *i. e.*, calcare basi adscendente sed apice tandem haud incurvo:

* Calcare prorsus recurvo apice haud inflato; capsulis *nutautihus*:

§ Foliorum segmentis 3-partitis vel 3-sectis lobis late-ovatis; caloarft parum adscendente petalis lateralibus dimidio longiore.

8. *C. oppositifolia.*

V Foliorum segmentis valde sectis, lobis oblongis :

T Calcare longissimo, magnopere adscendente :

f Foliorum segmentis 2-pinnatisectis; calcare petalis lateralibus plus quam duplo longiore; labio superiore apice obtuso :

Bracteis integris, floribus roseis. 9. *C. Boissieri.*

Bracteis flabellato-incisis; floribus luteis 10. *C. macrocentra.*

#Foliorum segmentis 2-ternatim sectis; calcare petalis lateralibus vix duplo longiore; labio superiore apice acuto.

II. *C. cyrtocentva.*

tCalcare brevi. abrupte adscendenli. petalis lateralibus haud longiore; foliorum segmentis 2-pinnatisectis. 12. *C. persiea.*

Calcare prorsus recto, apice plus minus inflato, petalis lateralibus quadrante longiore; foliorum segmentis 2-ternatim sectis; capsulis Patentibus. ** *G. Ledebouriana.*

1. *G. darwasica* Regel e\ Prain in Journ. As. Soc. Beng. XV, ^ 20 (1896); foliis 3-sectis segmentis omnibus longe petiolulatis lateralibus *-*. Jugim pinnaUseclw mediano W-jugim 2-pinnaUsecUs multo 1Tnnoriblls - tobis oblongis incisis; floribus rectiusculis calcare recto apice tamen abrupte uncinatim incurvo petalis lateralibus subaequilongo;

labiis ambobus crislatis, margins prasertim poslici magnopere explanatis margrae crenulatis.

52 f ! ''**f** Bo^ - et Buhse Nouv. Mem. Soc. Nat. Mosc. XII, II (1860), nec DC.

Opdalis persica Boiss. Flor. Or. I, 127, in parte (1867); Regel Act. Peilrop. m 694) , 16) fig g't

108KESTAMU : Darwas, A. Regel / P EBSU : prope Mmula> Buhte n. 179!

*iqs25mm. longus; calcar13mm. Jongum; petalalateralialia 10mm. longa.

inere are specimens of this plan, in Herb. Calcutta received from St. Petersburg in 188(3; these were collected by D' A. Regel at Tevildarrah in the Khanate of Darwas, but I have also had an opportunity of exaffli- P I I T I * of eXamples of the same sP<*ies belonging to the St. mersfiurg Herbarium, including one on which Professor Regel had at first written the name C dorwowa afterwards substituting, in pencil, we name «C. persica.; the specimen in question is one of the original examples of the plant described and figured by Regel under the ,alter name. I hav e likewise examined two flowers belonging to the Plant preserved i« the Boissier Herbarium, collected by Buhse near «assula' which was in 1860 referred by Boissier and Buhse to C. >•&• folu ^ was transferred by the former author in 1867 to C. persica.

for m plant is not very closely related to C. persica. It would appear that > Hegel, after deciding that the species was undescribed and after pre- m ^ T ^ ' R ^ figUrei had come to kno w thai his plant was the unde ood' M Bo plant and was * « • included in fi * '' »

In d S ; i ; i S sien It UoW appears th * * Rogers « view mS serve » of T ^ CirCumStanCeS, hare « « * » only just to con-

2, Corydalis diphylla Wall. Tent. Flor. Nep. 34 (1826); fol«s distincte petiolalis 3-sectis segmentis petiolulaUs subjequalibus 2-jugim pinnauseds lobis lanceolatis vel anguste oblongis; floribussubsigmoideis uicare ebasi lato, parum inervonetalis lateralibus paullo longiore, labiis mucronulatis.

Utrydalis longipes Don Flor. 1825) nec DC.

BSSR, 2, » » » » Prain in Journ. As. Soc.

Corydalis Hamiltoniana Don. Gen. Syst. 1, 442 (1831).

Corydalis few. in Trans. Linn. Soc. XX, 30 (1851).

Corydalis l. Asiat., t. 658, f. 2 (1854).

Corydalis rutsefolia H. f. et T. Flor. Ind. 1,262 (1855) et Flor. Brit. Ind. I, 12* (W72) in pane, nee DC.

HIMALAYA : Kamaon, Kashmir, Hazara. Kurram; frequens. Flos 20 mm. longus; calcar 11 mm. longum; pelala lateralia 10 mm. longa."

This species is the only member of the group that is really adequately represented in the Calcutta Herbarium; I have examined 97 specimens from 21 gatherings. The plant is easily distinguished from the other two by its long petioles. By a typographical error the citations of Griffith's figures of this and the next species have been transposed in the account of the Indian species of *Corydalis* given by me in the Asiatic society's *Journal*, part 2, vol. LXV.

³ *Corydalis Griffithii* Boiss. Diagn. ser. II, J, 15 (sphalmate Griffithii) (1853); foliis breve petiolatis vel sessilibus 3-sectis, segmentis omnibus longe petiolulatis 2-pinnatisectis lobis ovatis vel oblongis, bris incisus vel partitis terminali majore; floribus sigmoideis calcarum recurvo apice subincurvo, pelalis lateralibus triente longiore, labellis baud cristatis margine ampliatis explanatis apice retusis mucroiiulatis.

Corydalis sp. Griff. Ic. PL Asiat. t. 658, fr. 3 (1854).

Corydalis rutsefolia H. f. et T. Flor. Ind. I, 262, (1855) et Flor. Brit. Ind. 1,122 (1872) in pane, nee DC.

Griffith's ***» Boiss. Flor. Or. 1, 127 (1867); Walp. Ann. VII, 89 (Griffiths ii) (1868); Ailch. Journ. Linn. Soc. XIX, 151 (1882).

Corydalis * Pmim Prain in Journ. As. So& Beng. LXV, 2, 20 (1896) nec Cham. et Schlecht., nee Boiss., nee Regel.

AFGHANU : Bharowal Griffith Kurram, Aitchison! Ziarat, Gatacre! Flos 20-2 mm. longus; calcar 11 mm. longum; Pelala lateralia 8 mm. longa.

This species is known to me from original Griffithian specimens, and from specimens collected by Dr Aitchison that are preserved in the Calcutta Herbarium; I have also seen specimens obtained by M. Duthie's collectors and General Gatacre that are preserved in Herb. Saharanpur. The species is very much like *Corydalis* and may have to be merged in that species but it has a more slender spur? lips with narrower margins. Leaves with shorter petioles and nodding not spreading fruits; the bracts and leaf-segments are different.

⁴ * *Corydalis modesta* Prain; foliis subsessilibus 3-sectis, seg-

mentis omnibus dislinde peliolulalis lateralibus 2-3-partitis mediano 3-secto, lobis obovato-spathulatis obtusis vel subacutis; floribus sigmoideis, calcare petalis lateralibus plus quam dimidio longiore basi parum adscendente a medio ad apicem versus uncinatim incurvo, labiis ecrystalis ambobus margine parum ampliatis apice obtusis.

Cryptoceras modestum? Schott in Oestr. Bot. Wochenbl. VII, *ftv* (1857); Tchitatch. As. Min. I, 359 (1866); Walp. Ann. VII, 91 (*⁸⁶⁸),

ASIA MINOR : in montibus Beylan, *Aucher-Eloy* n. 402! PERSIA : Aderbidjan, prope Deliman. *Szovitz* n. 113 in parte! V. etiam spp. persica, loco exacto haud nolato, in Herb. Calcuttens. Flos 25 mm. longus; calcar 16 mm. longuin; petala lateralia 9 mm. longa.

The example of *Aucher-Eloy*, n. 402, examined by me is one that has been kindly lent from the Boissier Herbarium, where it is named *C. rutaefolia*. The locality however does not agree with either of the localities cited for *Aucher-Eloy*, n. 402, in *Flm\ Or.* I, p. 126 and p. 127; not having seen the other specimens so numbered I am unable to say whether they agree with the M¹ Beylan one. I have also been lent from the Boissier Herbarium part of a flower (lower lip absent) belonging to an example of *Szovitz*, n. 113 and bearing the name *C. persica*. It is not true *C. persica*, nor is it either of the two plants that seem to form the basis of «*C. persica* Boiss.» as opposed to true *C. persica*, but is conspecific with the plant collected by *Aucher-Eloy* on M* Beylan. The only specimen of this plant in Herb. Calcutta was received from Herb. Ke[^] under the name *C. rutaefolia* and bears a number, «372», but no note of collector or of locality.

That this plant is specifically separable from *C. rutaefolia* I hardly doubt, but I am not so certain that it is the same thing as *Cryptoceras modestum* Scholt. The description that Schott gives of the foliage of his species does not quite suit the foliage of the present one; the colour of the flower appears, however, to be the same in both, so far at least as may be judged from dried specimens. The chief reason for suggesting the identification now tentatively advanced is that this is the plant most like *C. rutaefolia* proper which has the uncinat spar of *Cryptoceras modestum*.

5. *Corydalis Sewerzovii* Regel Bull. Soc. Nat. Mosc. XLIII * 252 (1870); foliis sessilibus 3-seclis segmenlis lateralibus breve petiolulatis 3-partitis mediano longe peliolulalo minoribus, lobis ovato-spathulatis obtusis vel subacutis majusculis inlegris vel parum incis; floribus

sub sigmoideis ^{calca}re petalis lateralibus duplo longiore triente apicali
unⁿcmatim incurvo ceterum conico redo; labiis ecrislatis inarginibiis
parum explanatis apice subaculis.

Corydalis Sewerzovii Regel Gartenflora XXXI, 97, 1.1077 (1882); Hook.
fil. Bot. Mag. CXII, t. 689(5) (1886); Aitch. Trans. Linn. Soc. Ser. 2. III. 32
(1888).

PERSIA : Badghis, *Aitchison*, n° 1221 TURKESTANIA. Flos 45 mm. longus;
Icar 30 mm. longum; petala lateralibus IS mm. longa.

There are specimens of this species at Calcutta collected by Dr Aitchison;
I have also examined several specimens in the St. Petersburg collection.

6. *Corydalis rutaefolia* DC. Syst. Veg. II, 115 (1821); foliis sub-
sessilibus vel breve petiolatis 3-seclis, segmentis omnibus longe petiol-
ultis lateralibus integris vel 3-fidis mediano 3-secto lobis spalhulato-
Jvaiss; floribus fere rectis calcare petalis lateralibus quinta parte tantum
aOn^agiore apice parum bulboso ibique nonnunquam subincurvo labiis
ens(alis margine parum ampliatis postico apice truncato.

Pumaria rntifolia Sibth. ex Sm. in Fl. Graec. Prodr. II, 49 (1813); Poir.
Encyc Meth. Suppl. Y, 684 (1817); Sibth. Fl. Graec., t. 667 (1830).

Fumaria aniflora Sieb. Reis. Gret. II, 320, t. 8 (1817).

Fumaria cypria Sibth. Mss. ex DC. Syst. Veg. II, 115 (1821).

Cor dal *Corydalis rutaefolia* DC. Prodr. I. 126 (1825); Hook f. et Thorns.
Fl. Ind. 262. var. a. in parte (1855); Walp. Ann. IV, 187 in parte (1857);
Tchiiatch. As. Min. I. 358 (1866); Boiss. Fl. Or. 1.126, in parte (1867);
Hook. fii. et Thorns. Flor. Ind. [, 123, var. 1, in parte (1872).

Cory dal *Corydalis Erdelii* Zuccar. Abhandl. Muench. Akad. III. 252, t. 9. fig. 2
et 3 (1840); Walp. Rep. I. 120(1842).

Corydalis alpina C. Koch Linnaea XV, 252 (1841), nee J. Gay.

Corydalis libanotica Hochst. in Lorent Wanderung. 339 (1845). fide
Boiss. f. n. equaquam *C. libanotica* Hochst. Flora XXVIII, 30 (1845).

Corydalis rutmfolia var. *subuniflora* Boiss. et Heldr. in Boiss. Diagn.,
^ *. VHL, U (18 W); Flor. Or. I? 127 (1867).

Cryptoceras naifolium Schott. Oestr. Bot. Wochenbl. IV. 121 (1854);
Walp- Ann. IV, 190 (1857).

Cryptoceras pulchellum? Schott. Oestr. Bot. Wochenbl. VII, 150 (1857);
^chitatch. As. Min. I, 359 (1866); Muell. in Walp. Ann. VII, 91 (1868).

Cryptoceras purpurans Schott. Oestr. Bot. Wochenbl. VII, 150 (1857);
Tchiiatch. As. Min. I, 359 (1866); Boiss. Flor. Or. I, 126 (pro syn. **sphal-**

111816 *Purpurascens*) (1867); Muell. in Walp. Ann. VII, 91 (1868).

^ Cam : Jft. Lassiti, *Heldrichf* SYRIA : Mt. Hermon, *Lowne!* Flos. 17-
-J mm. longus; calcar 9-10 mm. longum; petala lateralia 8-10 mm. longa.
Our Calcutta specimens of *Corydalis rutasfolia* are unfortunately very
few in number; they comprise three from Mt. Hermon which manifestly
Belong to the form named *Cryptoceras purpurans* by Scholt, and four
from Crete which have been named by M. Boissier *C. rutifolia* var. *«*-
tMiflora. I cannot bring myself to look upon the smaller number of flow-
ers as a serious character and this plant I cannot follow M. Boissier in
treating as a variety, far less can I see my way to accepting the view of
Seber and of C. Koch that it is specifically separable. The corolla of this
plant from Crete agrees with that of the two plants figured by Zuccarini
as *C. Erdehi*. What *Cryptoceras pukhellum* may be, as apart from genuine
C. rutifolia, I cannot suggest; the description is quite inadequate.»
ought to well to separate the plant with a straight spur, which forms
Schott's *Cryptoceras purpurans*, as a distinct variety, but the material at
my disposal is insufficient to warrant my formally doing so here.

M. Boissier refers to two distinct plants named *C. libanotica* Hochst.; one
of these he reduces to *C. viamfoha*, the other he refers to *C. solida*. The
only descriptions of *C. libanotica* that I have been able to meet with are
these in *Flora* and in Walper's *Repertorium*; these descriptions certainly
refer to a plant that is not *C. ruUefolia*, yet strangely enough the *Index*
Kewenm only gives that one of M. Boissier's reductions which the des-
criptions mentioned do not warrant. The specimens of *C. ruUefolia* lent
me from the Boissier Herbarium belong to two different plants, neither
of which can possibly be considered conspecific with the Cretan species.
One of the two agrees with the accounts that are available of *C. opposite*
foha, the other is the plant that I have tentatively identified with *Cryf*
toçeras mdestum. Neither identification is verifiable here but in any case
neither of the plants has a good claim to the designation *I rutxfoUa*.

7. ***Corydalis verticillaris* DC.** Syst. Veg. IF. 114 (1821); fo«^s
sessuibus J-sectn., segmentis longe petiolulatis lacinulis lineari-oblongis
J-4-pmnalis; flonbus subrectis; calcare pelalis lateralibus triente longiore
wsi recto a medio parum adscendenle apice parum bulboso ibique sub-
Jneum' labiis ecristatis poslico margine minopere amplialo apice acuto.
(1 ^ : 7 ^{dalis} « " * « « * DC. Prodr. I, 126 (182S); Boiss. Flor. Or. I, 127

***Corydalis rutæfolia* var. β . Hook.** A e1 Thoms. Flor. Ind. I, 262
(1855); Walp. Ann. IV, 187 (1857); Flor. Brit. Ind. 1. i«», var. * (1872).
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Cryptoceras verticillare Schott Oestr. Bot. Wochenbl. IV, 121 (1854).

PERSIA : Kuh Mande, Stapf! Flos 16 mm. longus; calcar 9,5 mm. longum; petala lateralia 6,5 mm. longa.

W this species there are only 5 examples in the Calcutta herbarium; they were collected by D' Stapf. They show that it serves no useful purpose to reduce this plant to *C. rutzfolia*; its foliage is very dissimilar and the lowers too differ sufficiently to admit of its treatment as a distinct species.

Corydalis oppositifolia DC. Syst. Veg. H, 114(1821); foliis subsessilibus 3-sectis, segmentis lateralibus breve petiolulatis 3-partitis mediano longiuscule petiolulato 3-secto, lobis late ovatis; floribus falcatis calcare recurvo parum adscendente petalis lateralibus dimidio longiore, lobis ecristatis postico margine parum ampliato apice rotundato mucronato.

Corydalis oppositifolia DC. Prodr. 1.126 (1825).

Corydalis rutzfolia Hook. f. et Thorns. Flor. Ind. 1,262, var. a in parte (1857); Walp. Ann. IV, 187, var. a in parte (1857); Boiss. Flor. Or. I, 126 in parte (1867); Hook. f. et Thorns. Flor. Brit. Ind. 1, 123, var. 1 in parte (1872).

Cryptoceras oppositifolia Scholl, Oest. Bot. Wochenbl. IV, 121 (1854).

MESOPOTAMIA : Mesopotamia Tur Tschell supra Terek, 3000 p. s. m., Hausskn. Bot. Zeit. 1854, 101. «w/Flos 30-32 mm. longus; calcar 20-22 mm. longum; petala lateralia 10-12 mm. longa.

Of this I have only seen one specimen lent from the Boissier Herbarium. Here it has the name *C. rutzfolia*. I cannot see how it is to be included in *C. rutzfolia* as represented by the Cretan plant, without making it necessary to include in that species the one that follows this, which was considered by M Boissier to be *C. persica*, but which, owing to its proving the distinct from true *C. persica* I have proposed to name *C. Boissieri*. The foliage of *C. oppositifolia* is like that of *C. rutzfolia* and is very different from that of *C. Boissieri*, but the flowers of *C. oppositifolia* are like those of *C. rutzfolia* and are very like those of *C. Boissieri* and of *C. macrocentra*.

Corydalis Boissieri Prain; foliis sessilibus 3-sectis segmentis lateralibus longe petiolulatis lateralibus 1-jugis 2-pinnatisectis, mediano petiolulatis lateralibus 2-jugis 2-pinnatisecto multo minoribus, lobis oblongis incis; floribus calcaribus valde recurvo adscendenti, petalis lateralibus plus quam

duplo longiore. labiis ecristatis, postico margine minopere ampliato apice obtuso; bracteae integrae, corolla ut videtur purpurascens.

Corydalis persica Boiss. Flor. Or. I, 127 in parte (1867), nee Cham, e Schlecht., nee Regel.

PERSIA : Aderbidjan, prope Deliman, Szovitz, n° 113! Kaswin Sullanabad, *Strauss* /Flos 35 mm. longus; calcar 24 mm. longum; lateralalia 11 mm. longa.

Of this plant I have been able to examine three examples, two of which belong to Herb. Boissier. the third to Herb. Calcutta. The specimens from the Boissier Herbarium consist of that portion of Szovitz' n° 113 which agrees with M. Boissier's description of *C. persica* and of a from Kaswin that is conspecific with this part of Szovits' gathering.

The Calcutta specimen, collected by Strauss, belonged originally to Stapfs herbarium and was there doubtfully referred to *C. rntxfolM*. There are also examples of the same plant in the St. Petersburg Herbarium; there they are named *C. persica* and mixed with *£ darwasica*. The nearest ally of this plant is *C. macrocentra* Regel, with which it agrees in foliage and inform of corolla; it differs mainly in having entire bracts, those of *C. macrocentra* being incised, with apparently purple flowers, those of *C. macrocentra* being yellow.

10. *Corydalis macrocentra* Regel. Act. Hort. Petrop. YIH. 1.16, fig. a—f (1884); foliis sessilibus 3-sectis segmentis omnibus longe petiolulatis 2-jugim 2-pinnatisectis lobis cuneato-oblongis; floribus falcatis calcare valde recurvo adscendenli petalis lateralibus sublongiore, labiis ecristatis; bracteae flabelliformi-incisae. corolla lutea.

TURKBSTANIA : Darwas, A. Regel. Flos 38 mm. longus; calcar 28 nifl. longum; petala lateralalia 10 mm. longa.

Of this species I have seen specimens in the St. Petersburg herbarium. The chief differences between this and *C. Boissieri* have been detailed under that species.

11. *Corydalis cyrtocentra* Prain in Journ. As. Soc. Beng. 2. 20 (1896); foliis sessilibus 3-sectis segmentis omnibus longiuscule petiolulatis 2-ternatim seclis, lateralibus mediano parum minoribus, oblongis; floribus falcatis calcare valde recurvo adscendenli, petalis lateralibus quadrantibus tribus longiore; labiis ecristatis marginibus viampliatas apice acutiusculis.

HIMALAYA : Chitral, *YounhttsbandfHamilton*!

CORYDALIS PERSICA

This seems a very distinct plant; il. combi
 of C. b M « t a in * T, of Xn those there are however m be
 (L A **ri. in the St. W ^ ^ T i ^ A I - r i - * * « * f £
 of specimens that appear referaUe to C- as ^ fi .cyrtoc(!»t;«. The
 sp«r. though a good deal shorter u p t ^ ^ ^ ta the he-
 specimens on which the species is fo
 baria of Saharanpur and Calcutta. , , » , (18»);

12. Corydalis persi

foliis caulinis sessilibus forsa

recepto tamen folium alterum segme

lateralis minore singulo, alterum
 mediano detente gaudere «W», «J ^ n n a l i s e c t i s , k i s f l o n g i s

latis ^ a r a l i b u s i - j u g i m m e d r a n o W P a s c e n d e n t i p e l a h - W e r -
 i n c i s i s ; n o r i b u s f a l c a t i s c a l c a r e r e c u r v o r u b t e p a m p U a l o j p i c e

aUbus a. quilongo, labiis ecristaUs posUco

subacuto.

P_KHsu:G»*(Hb. Willd, n° 12916, V F d s 1 8 ^ l o n g U S ; c a l c a r
 • mm. iongum; peU»a lateralia 9 »» » based on , drawing o f

the original specimen of Hb. w»n

fessor Urban, and from a " ^ i Berlin. The original descrip-

very kindly lent from the Royal Herbam. t r e e o p p o s i t e l o n g - p e t o l e d

tion by C. Misso and Schlechtendal g w » J e r e i s ^ ^ ^ g m

leaves; the drawing however shows tot * v e s . n o t ^ I n a n y « *

this description. for U indicates ^ ^ * l o f t w o o p p o s i t e l e a v e s o n e

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projection which m«ff be the r u d u j * « a b o r t i v e a x i l l a r y r a c e m e . T h e

segment but which appears more J t o » , ^ ^ ^ 1 b u t o n 0 -

4als are not described by < ** % » £ , , , o t h e r s r e s p e c t s t h e ^ -

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well the fact that this plant is E M * M * Z £ # » and W - * y . i n d i g e s t e d

generic name ' * » » * . « ^ 1 i n ^ a n g ^ l i e f C a l c u t t a ,

About thr. ye»s * J J ^ i n t h e h e r b a n a o 355

material of the genus C o > ! < » « * » *

Saharanpur and St. Petersburg, I was led to suspect that some error had crept into our conception of *Corydalis persica* owing to my finding two very distinct plants in the St. Petersburg collection to which this name had been attached. One of these agreed very well with the description of *C. persica* given by M. Boissier, the other was, as the specimens themselves showed, the plant described as *C. persica* by Dr. Regel. Neither the one nor the other accorded with the description given by Chamisso and Schlechtendal of the flower of the genuine *C. persica*; finding that in this respect at least, the plant which suited the original description best is the species described by M. Boissier as *C. Griffithii*, I ventured in 1890 to treat *C. Griffithii* and *C. persica* as the same thing. I was not, however, satisfied that my solution of the difficulty had anything more to recommend it than those which had been advanced in turn by M. Boissier and Dr. Regel. Moreover, though I have seen authentic examples of *C. persica* Dr. Regel, I had seen no specimen of *C. persica* as understood by M. Boissier and had of course seen no specimen of the true *C. persica* of Chamisso and Schlechtendal.

Having made known my difficulty to H. Aufran, Curator of the Boissier Herbarium, the material detailed below was placed at my disposal through the kindness of M. Barbey :

1) a complete example of Szovitz. n° 113, from Persia, province Aderbidjan, near Deliman;

2) a single flower, without lower lip. from a second example of Szovitz, n° 113;

3) three flowers of another specimen named *C. persica* in the Boissier Herbarium, which forms the type of *C. rutifolia* Boiss. et Buhse. non DC. a plant reduced in the *Flora Orientalis* to *C. persica*.

4) a plant collected by Pichler at Kaswin. named *C. persica* by Boissier after the publication of the first volume of the *Flora Orientalis*.

The specimens numbered 1 and 4 are conspecific and are moreover conspecific with the St. Petersburg plant that is included under *C. Griffithii* which does not agree with the plant described and figured as *C. Griffithii* by Regel. The plant represented by 2 is not however the same as that numbered 1 though it bears the same distribution number (Szovitz n° 113) and is in reality conspecific with a plant from Beylan (Aucher-Eloy, n° 402), which M. Boissier has named *C. rutifolia* but which is in this paper named *C. modesta*. Finally the plant numbered 3 is not the same as any of the others but is conspecific with the plant that Dr. Regel considered to be *C. persica*. M. Boissier's citations are : a) to Gmelin's

plant; *b*) to Szovitz¹ plant and *c*) to the plant collected by Buhse. Against Gmelin's gathering, which is Hb. Willd. 12916 and is therefore the basis of *C. persica* Cham, et Schlecht., there is no mark of affirmation, indicating therefore that M. Boissier had not seen it. Finding this to be the case and learning moreover that, apart from the original plant, whatever it might be, *C. persica* Boiss. includes three quite different plants, I now turned for help to Dr Urban of Berlin whom I begged to compare, on my behalf, the Darwas plant which is *C. persica* Regel and the Deliman plant which is *C. persica* Boiss. with the Hb. Willd. plant (n° 12916) which is *C. persica* Cham, at Schlecht. I did not send an example of the Darwas plant to Prof. Urban, but of the Deliman plant I sent a single flower. The results of this comparison cannot be better stated than they have been by Professor Urban himself in the following reply to my letter :

• With great pleasure I give you my observations on the two *Corydalis* species.

• The *Corydalis persica* Boiss., Deliman leg. Szovitz. which we have not in our herbarium is, as the sent flower shows, certainly not *C. persica*.

• « Ch. et Schlecht. in Herb. Willd., n° 12916.

• The *C. persica* Regel, Darwas leg. Regel. which is also in our herbarium, does not seem the same plant as the one of Chamisso and Schlecht.

• The Deliman, which has the same habitus but the flowers are much smaller. • we spur shorter.

• I send you a little drawing of the type and one of the four flowers (the best) which I beg you to return.»

An examination of this drawing and flower showed that none of the three plants included in *C. persica* Boiss. agree with the genuine *C. persica*.

It is particularly true of the one that was taken for *C. persica* by Regel

• a curious circumstance in connection with *C. persica* is the fact that it has never been gathered since Gmelin's time; at all events it is not

Present in the rich collection belonging to St. Petersburg. It is not impossible, when the abnormal nature of its leaves are considered, that it

may be an unusual state of some of the other species of the group. Still I should hesitate to say which species it is most closely related to: so far

as the flower goes its nearest ally is *C. Ledebouriana* but its foliage is very different and it has the decurved pedicels that characterise all the species

of the group except *C. diphylla* and *C. Ledebouriana*.

***. *Corydalis Ledebouriana* Kar. et Kir. Bull. Soc. Mosc. XIV, 377 (1841); foliis sessilibus 3-seclis, omnibus petiolulalis, lateralibus

3-sectis mediano biternalim secto minoribus, lobis ovato-oblongis; Don-
bus subcrescentiformibus, calcare redo apice saepius parum inflato petals
lateralibus quadrante longiore; labiis ecristatis margine vix ampliato apice
acutis.

Corydalis rutaefolia Regel et Herder, Bull. Soc. Mosc. XXXVII, II, *^{o7}
(1864) nee DC.

Corydalis Ledebouriana Walp. Rep. I, 121, (1842); Hook. f. Bot. Mag.
CXIII, t. 0946 (1887).

SOONGARIA : *Karelia!* TURKESTAN : frequens v. s. in Herb. Petrop.[!] Flos
21 mm. longus; calcar 11,5 mm. longum; petala lateralia 9 mm. longa.

The specimens in Herb. Calcutta were collected by D^r A. Regel in
Turkestan, Alamantinka Minor; I have, however, examined many of^{tr}
specimens from Turkestan lent by D^r Balalin and have examined in
Europe examples of Karelin's original gathering. From the St. Petersburg
collection I have ascertained that the flowers vary considerably in &^{ze}
and somewhat also in colour (usually the corolla is pink and white bu^t
there are examples with uniformly pale-yellow flowers); the foliag^e
however remains very constant and the only species that is quite h^{se}
it in this respect is *C. cyrtocentra* from Chitral. The form of the flower
too is very constant in *C. Ledebouriana*, though there are some example^s
in the St. Petersburg Herbarium that I have referred to this species,
which have the spur tilted upward; but for the smaller size and the
swollen apex of the spur these might almost be considered conspecific
with the Chitral plant described as *C. cyrtocentra*.

— X —

LÉGENDE DE LA PLANCHE VF

1. *Corydalis darwasica* (sp. ex Darwas, leg. A. Hegel).
2. *Corydalis diphylla* (sp. e Chamba, leg. J. H. Lace).
3. *Corydalis Griffithii* (sp. e Kurrum, leg. Aitchison).
4. *Corydalis modesta* (sp. ex Mt. Beylan, leg. Aucher-Eloy).
3. *Corydalis Sewerzovii* (sp. e Badghis, leg. Aitchison).
- 6a. *Corydalis rufifolia* (sp. e Creta, leg. Heldreich).
- 6h. » » (*C. purpurans*) (sp. ex Mt. Hermn. leg. Lowne).
7. *Corydalis verticillaris* (sp. e Kuh Mande, leg. Stapf).
8. *Corydalis oppositifolia* (sp. ex Mt. Tur Tschell. leg. Haussknerht).
9. *Corydalis Boissieri* (sp. a Deli man, leg. Szovitz).
10. *Corydalis macrocentra* (sp. e Turkeslauiia, leg. A. Hegel).
11. *Corydalis cyrtocentra* (sp. e Chitral, leg. Younghusband).
12. *Corydalis persica* (sp. e Persia, leg. Gmelin).
13. *Corydalis Ledebouriana* (sp. ex Alamanlinka Minor, leg. A. Ht^ol).

(All the figures are X 2.)



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AGAVE SISALANA.

[Dictionary of Economic Products, Vol. I., A. 631-35]

SISAL HEMP.

Cultivation of the Plant in India, By MAJOR D. PRAIN, M. A., LL.D., I.M.S., Superintendent, Royal Botanic Gardens, Sidpur, Calcutta.

This review of the cultivation of Sisal in India recently appeared as No. 5 of the Bengal Bulletin. Major D. Prain's account of the experimental cultivation of Sisal Hemp in India is of great interest in that it shows a fibre that deserves to be widely circulated. It is highly desirable (with the kind permission of the Director of Land Records and Agriculture, Bengal) to re-produce it. In the present issue of *The Agricultural Ledger*.

The following is a summary of the account given by the Chief Secretary to the Government of Bengal, received from England the 18th July 1898, asking for information regarding the experimental cultivation of the sisal Hemp plant in India. Mr. Bolton, wishing to answer categorically the questions submitted to him, requested me to help him by supplying what information I could afford. The only question

Introductory.

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AGAVE
sisalana*

Experimental Cultivation of

DUCTORT,

to which a full reply could be given by me was the first. As, however, the remaining questions are exceedingly pertinent and practical, I suggested to Mr, Bolton the advisability of submitting printed copies of them to the different parties who have received Sisal Hemp plants from the Royal Botanic Gardens or from the Agri-Horticultural Society of India, requesting the favour of categorical replies to each. This suggestion having been approved, the questions were issued to all the gentlemen who have obtained Sisal Hemp plants from this institution; the Secretary to the Agri-Horticultural Society at the same time very kindly submitted the questions to all who have received plants from his office. The replies received contain much valuable information, and Mr, Bolton has now approved of the further suggestion that this information be made available to those who may think of attempting Sisal cultivation in India by issuing as a *Bulletin* of the Agricultural Series.

As the note submitted to Mr, Bolton has, in paragraphs B and C, confused the consignment of Sisal regarding which is specially asked with one previously imported, it seemed better, in answering the first question, to give a complete review of the attempts that have been hitherto made to introduce the plant into India; in order to render the information contained in the replies to the other questions more easily appreciated, it has seemed preferable, instead of printing separately the answers received from all those who have been so stated their experience, to give in every case a *Summary* of the information thus supplied.

Note desiring information regarding Sisal Hemp in India.

Note submitted to the Honourable C. W. Bolton, C.S.I. regarding Sisal

A.—Sir Charles Bernard wrote me on the 10th March, that on the 16th August, 1892, 4,900 plants of the Agave *var. sisalana* (the Sisal Hemp plant of commerce) were sent to India from Kew, which had been recently imported from Florida and that samples of fibre made from these plants had been forwarded to the Imperial Institute in 1896, where the latest information could be obtained as to the Sisal Hemp industry in India.

B.—On application at the Imperial Institute and at Kew, no information could be given as to the fate of the plants sent out to India in 1892, nothing had been heard about them at Kew, and it was on

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Sisal Hemp in India*

(D. Prain.)

AGAVE
sisalana*

known had been received from the Botanical Gardens at Saharanpur.

The Director of the Indian Section of the Imperial Institute kindly forwarded letters that I had addressed to him on the 12th of August 1892 to the Reporter on Economic Products, Calcutta, which resulted in my obtaining 50 Sisal Hemp plants from the Superintendent of the Botanical Gardens, Saharanpur, from 50 plants which were received there in 1892, from the Superintendent of the Royal Botanic Gardens, Calcutta, stated to be probably a portion of the consignment sent to India by the Director of the Royal Gardens, Kew.

With the exception, I have not been able to ascertain anything about the plants, which were sent out from Kew in August 1892, and I am very anxious to get the following particulars about them, with reference to the treatment of 5,000 plants, which I am sending out :—

- (1) How were the 4,900 plants distributed that were sent out from Kew on the 16th August 1892, to what persons, in what parts of India?
- (2) What soils were they planted in; what distances apart; what growth have they attained; height; width; average number of leaves per plant; length and width of leaves; weight of leaves?
- (3) How long, after being planted out, did they give out suckers; how many suckers does each plant on an average produce every year?
- (4) Were they planted out on raised ground, banks, etc., or on high land, but not raised above the surface of the soil? What soils suit them best? Will they succeed on lands raised with salts, known in Bihar as "Oosur"?
- (5) Have any of them died through being planted on damp ground, from cold, or from other causes?
- (6) What length of fibre has been obtained from them, and what is its commercial value; what weight or what number of leaves yield a given quantity of dry fibre?
- (7) How soon after the plants are planted out, can their leaves be cut for extracting fibre, and in how many years after being planted out, do they attain their full growth?

NOTE DISSEMINATING INFORMATION.

FartiouUri wanted.

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AGAVE
sisalana.

Experimental Cultivation of

NOTE DE-
SIRING
INFORMA-
TION.

- (9) How was the fibre prepared that was made from them ?
- (10) Has any commercial quantity of fibre been made from ^{*j^{he}} *Sisal hemp plant* in India, say a bale or two, and ^{with} what result, as to yield from the plants, and ^{price} obtained for fibre ?
- (n) Has their cultivation been attempted anywhere in Ind^{*3^v} on a large scale, for commercial purposes ?

Replies.
Distribution
of the sup-
ply sent
from Kew
in 1892.
Question 1.

REPLIES TO QUESTIONS IN THE FOREGOING NOTE.

QUESTION 1.—How were the 4,900 plants distributed ^{that} were sent out from Kew on the 16th August 1892; [^] what persons ; in what parts of India ?

Only 473 Plants of this consignment lived to be distributed 400 of them were made over to the Agricultural Society of India by order of the Government of India, the remaining 73 were sent from the Botanic Garden, Calcutta, to the following persons, viz-—

Mr. A. Peppe, Ranchi, Chota Nagpur.	20
Superintendent of Jail, Ranchi, Chota Nagpur	12
Deputy Superintendent, Port Blair, Andamans...	10
Mr. J. Peter, Mertinga, Manumukh, Assam «.	20
Deputy Conservator of Forests, Sonthal Par- ganas, Bihar	4
Mr. J. Cfittayangam, Coimbatore, Madras ...	6
Superintendent, Cossipore Institution of Prac- tical Horticulture, Lower Bengal ,, ...	*

How the
plant was
introduced
into India.

As, however, it is impossible to separate the plants of the consignment, distributed by the Agri-Horticultural Society of India, from those of a consignment previously imported by Sir George King, of which the Agri-Horticultural Society also received a considerable share, the present position of the Sisal Hemp industry, which the question is intended to elicit, may be best explained by giving a brief account of the introduction of the plant into India.

When Sir George King, Superintendent of the Royal Botanic Garden, Calcutta, was on leave in 1888, the authorities at Kew kindly undertook to arrange for a consignment of Sisal Hemp plants (*Agave rigid* var. sisalana*) being obtained from America and sent to the Calcutta Garden.

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Sisal Hemp in India.

[D. Prain.]

AGAVE sisalana,

This consignment reached Calcutta on 9th July 1890, and it was found on its arrival that every plant was dead and rotten. This first attempt to introduce the plant on an extensive scale (one earlier minor attempt will be alluded to later on) was therefore a failure. Sir George King did not, however, give up his intention of introducing Sisal to India, and at his desire the Director of the Royal Gardens, Kew, kindly purchased for 25 dollars of the Royal Gardens, Kew, Messrs. Reasoner Brothers of Florida a lot of 1,000 Sisal plants. This purchase was made in June 1891. The plants were sent to Kew, where the Director permitted them to remain till they were considered ready to stand the voyage. On 1891, a consignment reached Calcutta on 29th October. It was found that 125 plants were quite dead and the rest were in rather a bad state, as many as 232 of the plants being subsequently lost after their landing. The second attempt to introduce the plant was thus partially successful, as many as 643 of the consignment of 1,000 plants remaining alive. It was seen how ever that the natural conditions which prevail in the Ganges valley are unsuitable for this species and steps were taken to distribute the plants as soon as possible. The assistance of the Horticultural Society of India, which is always at the disposal of the Government of Bengal in matters of this kind, was invoked, and 357 plants out of the total of 643 were made over to them, who on 29th April 1892 for distribution among its members. Between April 1892 and March 1893 the rest of this consignment was distributed to various parties in India with the exception of seven plants put out in the Royal Botanic Garden and kept in stock. The distribution is shown fully in the sub-tabular statement :—

INTRODUCTION OF THE PLANT INTO INDIA. First supply sent from Kew in 1890.

Second supply sent in 1891.

Partly successful.

Distribution of plants sent from Kew in 1891. (Second supply.)

DATE OF DEUWKRY.	Parties to whom made over.	Number of plants issued.
1	2	3
29th April 1892	Agri-Horticultural Society of India	357
15th July	Government Botanic Garden, baharanpur.	So
15th	Government Horticultural Garden, Lucknow.	So

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AGAVE sisalana.		Experimental Cultivation of		
DISTRIBUTION OF PLANTS SENT FROM KEW IN 1891.	DATE OF DELIVERY,		Parties to whom made over.	Number of plants issued'
	I		2	3
(Second supply.)	15th July 1892	.. ..	State Gardens, Gwalior.	5 ⁰
	25th	.. ..	Agri-Horticultural Gardens, Lahore.	5 ⁰
	30th	.. ..	Lecturer on Botany and Agriculture, Poona.	15
	8th September 1892	.. ..	Deputy Superintendent, Port Blair.	25
	4th October	.. ..	Mr. J. W. Burnett, Tellicherry.	10
	23rd February 1893	.. ..	Deputy Superintendent, Port Blair (second issue).	10
	nth March	.. ..	Manager, Mahamera Tea Estate, Desangmukh, Assam.	12
	27th	.. ..	Honourable J. W. Buckingham, CXE., Amguri, Assam*	3
			Total distributed ..	63*
			Planted in Royal Botanic Garden, Calcutta	4
			Still in stock in nursery on 27th March 1893*	7
				II
			Total of living plants in consignment*	643
			Received dead	125
			Sickly on arrival and afterwards died	23 ²
			Total of dead plants	SS7
			Total purchased	1,000

A. 63I-35*

Sisal Hemp in India.	[D. Prain.]	AGAVE sisalana*
<p>The authorities at the India Office appear to have become aware of the efforts of the Government of Bengal to introduce Sisal to India and to have generously decided to relieve it of the expense it was thus incurring, for on 16th August 1892 a third consignment of 4,900 plants was sent out from Kew to India and a semi-official letter of advice from the India Office was addressed to Sir George King announcing the fact. This consignment was forwarded for the Royal Botanic Garden, Calcutta, but the Government of India in the Department of Revenue and Agriculture, and by a telegram, dated 7th September 1892, Sir George was instructed to make over 2,000 plants to the Secretary to the Agri-Horticultural Society and 500 to Mr. G. Dickinson, Kumeresth Estate, Mysore, and to dispose of the balance as was thought best. The consignment did not reach the Botanic Garden till October 14th, 1892, and it was found that only 2,984 plants remained alive of the total consignment of 4,900 and that these were in a very sickly condition. The Government of India was, therefore, asked to sanction the retention of the consignment till some of the survivors had recovered sufficiently to admit of their being distributed. It was evident that very few of the sickly plants must ultimately die, and that there would not be left enough to provide 2,000 for the Agri-Horticultural Society and 500 for Mr. Dickinson. It was, therefore, suggested that the survivors be distributed in the proportion of one to Mr. Dickinson for each four to the Agri-Horticultural Society. The Government of India approved of this suggestion on the 21st November 1892. Of the 2,984 still alive but sickly on their arrival, as many as 2,511 died before June 1893, and by an arrangement effected, I believe, in conversation between Sir Hard Buck, then Secretary to the Government of India in the Department of Revenue and Agriculture, and Sir George King, it was decided that it was not worth while sending a consignment to Mysore, as the chances were altogether against the plants standing the journey. It ought to be added that Mr. Lechlynden, then Secretary to the Agri-Horticultural Society, visited the Botanic Garden on more than one occasion to see the plants, and it was not until he felt satisfied that those intended for the Society were fit to be moved that any of the surviving plants were sent out. The actual distribution of this consignment, the one now under reference from the India Office, has been as follows (as the consignment was not intended for</p>		<p>DISTRIBUTION OF PLANTS SENT FROM KEW IN 1892, (Third supply.)</p>

A. 631-3S

AGAVE sisalana*		Experimental Cultivation of		
DISTRIBUTION OF PLANTS SENT FROM KEWIN 1802. (Third supply.)	the Government of Bengal, none of the plants belonging to have been kept at Calcutta):—			it ^^^
	DATE OF DELIVERY.	Parties to whom made over.	Number of plants issued.	
	1	2	3	
	5th June 1893.. ..	Agri-Horticultural Society of India (second issue).	40a	
	19th July „	Mr. A. Peppe, Ratnagar, Ranchi	10	
	10th August „	Deputy Superintendent, Port Blair (third issue).	20	
	nth „ „	Mr. J. Peter, Mertinga Tea Estate, Manumukh.	1	
	20th September 1894 ..	Superintendent, Cossipore Institute of Practical Horticulture.	6	
	18th June 1896 „ ..	Mr. J. Chittayangaa^Coimbatore	4	
	5th August „	Deputy Conservator of Forests, Sonthal Parganas.	12	
2nd February [897 ..	Superintendent of Jail, Ranchi.	473		
Total distributed ..			473	

Stock exhausted.

Total of living plants	473
Received dead	1,916
Sickly on arrival and dying subsequently	2,511
Total of dead plants	4,427
Total despatched from Kew, 16th August 1892	4,900

Agri-
Horticultural Society
of India.

The subsequent history of the plants of these consignments that were made over to the Agri-Horticultural Society of India has been that practically all were distributed to members of the Society.

A, 63I-3S*

Ledger.

AGAVif
sisalana*

(D. Prain.)

Sisal Hemp in India.

BENGAL.
Distribution
of Sisal
plants by
Agr.
Sociol-
tural
Society.

the Secretary found
likely to be interested in Sisal cultivation
his experience as to the unsuitability of
in the neighbourhood of Calcutta and
and in the Society's gardens only a few
joined list of parties who have been kindly supplied
the Agri-Horticultural Society of India
the present Secretary to the far
dates of issue are not shown, and
the various lots distributed belong to
by Sir George King for the Government
far they belong to the consignment
for the Government of India in 1892:

Parties to whom made over.	Number of plants issued.
Mr. J. D. Macgregor, T. Aoot	50
Mr. J. Lawrie, Dauracherra, Cachar	50
Mrs. H. Herbert & F. Mackenzie, Calcutta	50
Messrs. H. E. Abbot & Co., Kangekoah Tea Estate, Assam	100
Chota Nagpur Tea Estate, Ranchi	50
Mr. A. Cook, Ranchi	50
Mr. E. M. Thomson, address not given	50
Mr. E. Bryning, Messrs. Grindlay & Co, Calcutta	150
occasions	343
Others in small batches ranging from 2	
TOTAL	1,043

As this number is in excess of the amount at multiplication by
made over to the Society, it is evident that multiplication by
sets has been taking place to some extent at different

The subsequent history of the plants in
places has varied a good deal.
Of the 50 plants of the 1891 consignment to Saharanpur,
G. Goian, Superintendent, reports that he has
sent up by to have been sent to all parts of the world, but he has
no exact record of their distribution; ms

Saharanpur.

631-35

AGAVE sisalana.

Experimental Cultivation of

SAHA-RUNPUE.

impossible to keep an account of everything sent out. Before Mr, **Gollan** received these, he had, however, a single specimen of the Sisal Hemp plant yielding suckers. This plant was the sole survivor of several small suckers received by post in 1885 or 1886 from Messrs. Reasoner Brothers, Florida.

Luoknow.

(2) Of the 50 plants of the 1891 consignment sent to Lucknow, 40 were planted out in the Date Plantation, this being the only available spot. Several had died while they were kept in the pots. The Sisal plant, Mr, **Ridley**, Superintendent, reports, has not done well at Lucknow, owing to its being planted in poor soil.

Gwalior.

(3) From the 50 plants of the 1891 consignment sent to Gwalior, Mr* **Maries**, Superintendent, reports that he has already managed (1898) to rear 55 more; he has now 105 large plants that yield suckers freely, and hopes to put out several thousands this season.

Lahore.

(4) Regarding the 50 plants of Ae 1891 consignment sent to Lahore, no report has been received.

Bombay, Mr. Woodrow's report.

(5) Of the 15 plants sent to Poona, Mr, **Woodrow**, Lecture in Botany and Agriculture there, reports as follows:—I have the honour to precede my replies to the queries submitted to me by a statement of the plants received and on hand at this date—

Received in 1892 from the Calcutta Botanical Garden.						J:*
Ditto	ditto	Saharanpur	ditto	..	..	2
Ditto	ditto	Kew	ditto	..	..	f 2

On hand in September 1898 at Poona	..	..	..	..	..	400
Ditto	ditto	Nandgaon	..	..	..	400
Distributed	..	..	..	..	..	60

TOTAL .. £ 860

Summary of particulars regarding plants sent to Poona.

It may, therefore, be assumed that the 15 plants sent to Poona from Calcutta of the consignment of 1891, having been by propagation, increased to 400 full-grown plants. It is noticed that 12 plants were sent direct to Poona from Kew in 1892, perhaps about the time that the consignment of 4,900 under reference was sent to the Government of India. But these 12 plants did not form part of that consignment. It will also be observed that 2 plants were sent in 1892 to Poona from Saharanpur. As these could not both have been part of the

A* 631-35.

Sisal Hemp in India*	(D. Prain.)	AGAVE sisalana»
<p>Government of Bengal consignment of 1891, since Mr. Gollan still has 49 of the original 50 plants given to him of that consignment, 1 has been sent to Mr. Gollan regarding them. Mr. Gollan informs me that neither of the two belonged to the consignment sent to him by Sir George King, but that both were suckers obtained from Florida to Saharanpur in 1885 or 1886. In the revised prospectus of a proposed "Bombay Sisal Company" Mr. Woodford states that 29 plants are said to have increased to 10,000. This includes not only all suckers, but also all the small ones from the original plants, which have now begun to pole.</p>		POONA.
<p>(6) Of the plants sent to the Andamans on three separate occasions 3 belong to the Bengal consignment of 1891 and 10 to the official consignment of 1892. Mr. E. H. Mansfield reports that there appear to be two varieties of the plant, one having almost minute thorns along the edges of the leaf the other having much longer thorns. As Mansfield happens to be the only office supplied from the Calcutta Garden with plants from both consignments it is interesting to find this remark in his report; in none of the other parties who reply to the questions put by the India Office mention this fact, it leads one to suspect that the plants of the two consignments may have differed somewhat. Unfortunately all the plants of the India Office consignment, which were not intended for the Royal Botanic Garden, were distributed at the time, however, that there were plants of consignments in the Calcutta nurseries the two did not differ materially. Of the whole 45 plants sent to Port Blair 240 were still alive. Twenty-four of them are now suckers now at the rate of 6 per plant annually, and 240 plants have thus been already obtained.</p>		Andamans.
<p>(7) Of the 10 plants of the 1891 consignment sent to Tellicherry, Mr. B. U. Sturton has 8. They throw out suckers freely and never having been moved, now form a matted mass of suckers, etc., and look very healthy.</p>		Madras. Tellicherry.
<p>(8) Of the 22 plants of the 1891 consignment sent to Desangmuki 11 are still alive.</p>		
<p>(9) The 3 plants of the 1891 consignment sent to Honourable J. S. Cunningham, CLE, only 1 is now alive, but from SUGS yielded by Mr. Buckingham has obtained 4 young plants.</p>		Assam. Desangmukh.

A. 631-35*

AGAVE
sisalana.

Experimental Cultivation of

KESTILT
OFEN-
QUIHIES
MADE.
re plants
ient from
Kewin
1802.
(Third
upply.)

For the India Office consignment of 1892 as apart from^{TM11-} Bengal consignment of 1891, no definite information can be gi[^] as already explained, as regards the plants made over to the Ag⁺ Horticultural Society of India, or as regards those sent to^{the} Andamans. As regards the others :—

(1) Mr. Peppe of Ranchi, who received 20 plants, has n^{ot} replied to my request for information.

(2) Mr. Peter of Mertinga Tea Estate, Manumukh, who receive^d 20 plants, does not say how many new plants he has been able to^{propagate}, but the number is probably considerable since he^{reports} having put down 20 to 30 acres.

(3) The Superintendent of the Cossipore Institution of Practi^{ca} Horticulture, who obtained a plant, has not answered my enquire^{*}

(4) Mr. Chittayagam, Coimbatore, who received 6, has^{not} replied to my letter of enquiry.

(5) The Deputy Conservator of Forests, Sonthal Parganas, w^{ho} obtained 4 plants for the Kalikhand Nursery, still has all 4^{ad} has 16 young plants raised from suckers.

(6) The Superintendent of the Ranchi Jail has not answer^d my letter of enquiry; he obtained 12, but has only had them for^{two} years.

In order that as full information as possible might be obtain^e regarding the various points to which the India O&ce^{directs} attention, printed copies of the questions were sent to every^{correspondent} of the garden who has received plants of^{the} and replies, more or less complete, have been received fro^m the following:—

Superintendent, Botanic Garden, Saharanpur.

Ditto, Government Garden, Lucknow.

Ditto, State Garden, Gwalior.

Lecturer on Botany and Agriculture, Poona.

Deputy Superintendent, Port Blair.

J* W. Burnett, Esq., Tellicherry.

Manager, Mahamara Tea Estate, Desangmukh.

Honourable J. Buckingham, C.I.E.

h Peter, Esq., Mertinga Tea Estate, Manumukh.

Deputy Conservator of Forests, Sonthal Parganas.

A* 631-35*

Sisal Hemp in India.	{D. Prain.}	AGAVE sisalana*
<p>La*caster, Secretary to the Agri-Horticultural Society of Was So * 000* as to sen<* C0Pies o* *e o:ues tions to all the whose add resses could be ascertained, that had received from the Society and has transmitted to me copies of the received from the following gentlemen :—</p>		<p>BESULT OPEW- QUIBIES rt plants sent to India in 1802.</p>
<p>J* ?>^acgregor, Esq., Arrowah Concern, Saran. * Lawrie, Esq., Lungai, Munshi Bazar, Sylhet. Messrs. Thomson & Mylne, Jagdispur, Behea. ^nager, Lunglah (Sylhet) Tea Company, Limited. A.Cookc, Esq., Ranchi. Manager, Pathecherra Tea Estate, Cachar.</p>		
<p>A *reais o* tne information contained in these replies is given und*? ea ch of the remaining questions.</p>		<p>Abstract of information received.</p>
<p>QUESTION II*—<i>Whai soil were they planted in: whatdis- tances a\$ar*; what growth have they attained; height; width; f vera & e nuf nber of leaves j>er \$lant; length and width of leaves; average weight of leaves ?</i></p>		<p>Question II,</p>
<p>At S_a h_{ran} Pur, the plants were put out in heavy loam 3 feet by 3 feet apart; at A_{uc} A_{now} in poor sandy loam 6 feet by 6 feet apart; at G_w r_{ile} y were placed in red soil without manure or irriga- tion; at P_{oo}na in strong loam not manured, slightly irrigated P_{oo}na t_{at} 6 feet by 6 feet apart (it has since been found at W_{ee} p_{la} 5 feet by 5 feet apart is suffi- Tellicherry, they were p_{la}ce in a vegetable garden, in ordinary Malab_{er} l_{ite}, 3 feet by 3 feet a part. at Mertin_{ga} Assam, in stony J_{er} g SOIL 5 feet by 5 feet apart; at Katikund Sonthal ?ar gana, m hard reddish poor soil with gravel a foot and a half below, 3 f_{et} by A_{ee} t a part »' at Arrowah, Saran, in sandy loam, at j_{anch} k_{et} t apart; at Lungai, Assam, in light sandy soil; soil, et_{am} tea; at Pathecherra, Cachar, in good loamy soil, et_{am} art.</p>		<p>Soil in which planted and distance apart.</p>
<p>feet as a_e thus three instances of the selection of 3 feet by 3 of e f_t th_e distan_{ce} apart against two of 5 feet by 5 feet and two feet by 6 feet There is no doubt that 3 feet by 3 feet is t_o close, w_hile 20 feet by 20 feet, the distance in one case, is too r_{at} mote. Per_{ap}s 5 feet by 5 feet is the best distance. The h_{ei}ght and width of the plant varies a good deal, 2 feet 9 inches</p>		<p>Abstract of replies received.</p>
		<p>Height and width.</p>

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AGAVE
sisalana*

Experimental Cultivation of

ABSTRACT
OF RE-
PLANTING
HEIGHT AND
WIDTH.

by 3 feet 6 inches being the smallest (Sonthal Parganas), but in this case the soil was very poor and the plants had been received only two years before. Almost as small, however, are the plants at Lucknow, 3 feet by 4 feet; these are planted in poor loam. The height is given at 5 feet at Gwalior; at 5 feet with a width of 9 feet at Saharanpur (heavy loam); at 5 feet 3 inches width 6 feet, at Mertinga, Assam; at 6 feet, width 6 feet, at Desangmukh, Assam; at 6 feet, width 8-9 feet, at Port Blair (plants 7-11 feet apart); at 6 feet 6 inches at Pathecherra, Cachar; at 7 feet (in light sandy soil) at Dauracherra, Sylhet; at 7 feet, width 7 feet, at Poona; and at 8 feet, width 8 feet, at Arrowah, Saran (plants 20 feet apart).

Number of
leaves.

The number of leaves per plant also varies a good deal; 25-30 at Lucknow (poor soil); 35 in Sonthal Parganas only two years put out; 50, Saharanpur, Cachar, Tirhut; 60-70, Port Blair; 72, Mertinga, Assam; to 80, Poona. The length and width of leaves also varies as does the weight; from 2 feet by 3 inches, weight about 5 ounces (Sonthal Parganas) and 6 inches by 3J inches, weight 8 ounces upwards. The largest leaves reported as those from Tellicherry, 6 feet 3 inches to 6 feet 6 inches long by 4 to 5 inches wide weighing 2 lbs. Lungai, Sylhet, 5 feet 6 inches long by 6 inches wide weighing 3 lbs. More usual sizes and weights are 4 feet 6 inches by 5 inches (Poona), 4 feet 6 inches to 5 feet by 5 inches (Port Blair) 5 feet by 5 inches (Arrowah, Saran) all weighing 2 lbs. length, width and weight recorded from Saharanpur are 4 feet 6 inches by SJ inches weighing 1J lbs. and from Desangmukh 4 feet 4 inches by 4 inches weighing 1J lbs.

Question III.

QUESTION III.—HOW long after being planted out did they give out suckers; how many suckers does each plant on average produce each year?

When the
plant
produced
suckers.

At Saharanpur and in the Sonthal Parganas the plants began to send up suckers in the second year, though at Saharanpur only stronger plants did so; while at Lungai, Sylhet, they began to appear in the first year, and at Pathecherra, Cachar, they are stated to have begun to appear in the first or second year. At Port Blair they began to appear in the second or third year, but only partially. Arrowah, Saran, after 2 J years. At Lucknow and at Poona, suckers began to appear only in the third year, while it is reported that at Mertinga, Assam, no suckers appeared till the fifth year, and the

Abstract of
replies
received.
Question III.

A. 631-35.

Sisal Hemp in India.

(D. Prain.)

I AGAVE
I sisalana.

only partially, and at Ranchi it is said no suckers have yet appeared at all.

The average number of suckers per plant per annum is given at Vunthe Sonthal Parganas, 5 at Poona, and 6 at Port Blair, Saharanpur and in Tirhut the number is given at 9-12 and 10, 12 respectively.

QUESTIONS—*Were they planted on raised banks, etc., or on ground?—and, but not raised above the surface of the*

At Saharanpur the plants were planted on raised banks. At other places from which reports were received they were raised on ground or on ground above flood level, but not raised at Poona where the plants were put out partly on raised banks, partly on high land not raised. It was found at Poona that there was no perceptible difference in the plants from the two situations.

QUESTION—*What soil suits them best? Will they succeed on lands impregnated with salts, known in Bihar as "Oosur"?*

Here a decided difference of opinion exists. The Manager, Patancher Tea Estate, Cachar, says the richer the soil the better the plant, and Mr. Cook of Ranchi is of much the same opinion, while Mr. Manager of Dauracherra, Cachar, says light sandy soil is best, but ordinary soil does very well, and remarks that if soil be too rich there is rapid growth, but the fibre is then not so raised. Gollan, Saharanpur, finds heavy loam of an embankment to suit them well, and Arrowah, Tirhut, advocates good sandy loam. Biplaplior, finds ordinary red soil very good; Mr. Stony soil, and Poona, states that rough, stony soil with 15 per cent. lime suits them well.

As regards "Oosur" only two correspondents venture to express an opinion. Mr. Maries, Gwalior, says the plants do well in "Oosur" if grown on raised mounds, while Mr. Macgregor, Tirhut, says they will not grow on "Oosur."

QUESTIONS—*Have any of them died through being slanted?—and from cold or from other causes?*

The plan of the correspondents say that none of them have died. Mr. Gollan, Saharanpur, says they were planted in damp ground, but plants under pot have died, probably from overwatering. Mr. Ridley, Lucknow, has had the same experience; Mr. Buckingham, Assam, lost most of his plants from their having been

ABSTRACT
OF RE-
PLIES RE-
CEIVED.

Number of suckers per plant.

Question IV,

Whether planted on raised or level ground.

Question F.

Soil best adapted.

"Oosur."

Question VI,

On casualties.

A* 631-35*

AGAVE
sisalana*

Experimental Cultivation of

ABSTRACT
OF RE-
PLIES RE-
CEIVED.

Question VI.

planted in too shady a spot; Mr. Man, Port Blair, lost those that were planted in a damp spot. Mr. Macgregor, Arrowah^{*} Tirhut, reports that 50 per cent, of his plants died within a month of being put down *in Sots*; the rest are thriving luxuriantly. The Manager of Lungla Tea Estate, Sylhet[†] states that all the plants received in 1893 died through neglect during his absence in England in 1894. Mr. Coombs[‡] of Ranchi says that several, planted in poor soil, died.

Question VII.

QUESTION VII.—*What length of fibre has been obtained from them, and what its commercial value; what weight of what number of leaves yield a given quantity of dry fibre?*

Length of
fibre,

The Manager, Pathecherra Estate, Cachar, finds the average length of fibre to be 36 inches, but says nothing about the proportion of fibre obtained to leaf employed. Mr. Peter, Merting[§], Assam, finds that 184 ms. of leaf yield 6 lbs. of dry fibre, & does not state the average length of fibre obtained. Woodrow, Poona, also finds the fibre to average 36 inches in length; and finds the proportion of fibre to leaf to be about 3 per cent. Mr. Burnett, Tellicherry, obtained from a single leaf 78 inches long, fibre 78 inches long, and from another leaf 74 inches long, fibre 74 inches long. The weight of the first leaf was 44 oz., the quantity of fibre obtained weighed 2 oz. Mr. Burnett's ratio is thus from 4J to 5\$ per cent., and is considerably higher than that of Mr. Woodrow and Mr. Peter. His samples seem to have been prepared with special care.

Commercial
value.

Having seen it stated that the Right Honourable Chamberlain, was making a profit from Sisal in the Bahama Mr. Burnett was led to submit a sample of his fibre to a firm of brokers in Mincing Lane; the name of the firm not mentioned. The firm praised the quality of the sample, but did not give quotations, and expressed a doubt as to whether any profit was being made in the Bahama Sisal Plantations. The matter, therefore, ended there.

Reports of
experts.

Mr. Woodrow, Poona, sends a reprint of a note on Sisal Hemp from the Indian Textile Journal in which the reports of three London firms on samples of Sisal fibre from Poona are quoted in full. Messrs. King, King & Co.'s broker reports that in length and brightness the sample is considerably far above the average, partaking of the character of Bahama Sisal rather than Mexican, and at the present moment is worth £30 a ton. If Sisal were offered more freely, there would be

A, 631-35.

Sisal Hemp in India*

(D Prain.)

AGAVE sisalana.

a drop of trade could be done in the quality of the sample packed in bales of 2 cwt.

Messrs. Kfrkdl & Co., produce brokers, report the sample as superior quality, similar to the better class of Bahama Sisal, and likely to sell freely in London at market prices. The value of the past 12 months has at times exceeded £30 per ton; in the market the value is about £22 to £23 per ton landed in London, but an average value of about £18 per ton would be nearer the mark. Messrs. We & Christie's broker reports that the Poona sample of Sisal is good, bright and well cleaned, its value being £2 per ton at the time of report. However, rates were nominal, and the broker considered that to get a large use of £10 per ton less money was wanted.

Samples have been sent to me from Mertinga, Assam; from Tejen, from Saharanpur; and from Gwalior, as well as from Poona. The Gwalior sample is quite and the others nearly, if not quite up to Poona sample as regards brightness. Saharanpur, informs me that the Imperial Institution was furnished with fibre from Saharanpur through Dr. Watt in February 1896 and again in October 1896. The fibre was produced in the plants sent to Saharanpur by Sir George King in 1892. The fibre was sent spontaneously to Dr. Watt by Mr. Gollan as Mr. Gollan wished to have Dr. Watt's opinion. Dr. Watt forwarded that fibre to the Imperial Institute. The second lot was sent at Dr. Watt's request. Gollan is under the impression that he told Dr. Watt that the fibre was the produce of plants sent to Saharanpur by Sir George King in 1892. It is probable that this statement is the result of the authorities at the India Office to suppose that the Saharanpur fibre was the produce of the 1892 consignment sent by the India Office. As I have already indicated, however, Mr. Gollan received no plants of that consignment, and was in all probability unaware of its ever having been sent. The mistake, however, is not of material consequence.

QUESTIONS. How soon after the plants are planted out can they be used for extracting fibre, and in how many years do they attain their full growth? The Ser, Pathecherra, Cachar, says the leaves may be cut after a year, but the plants do not reach their full growth for four years.

I do not find from the correspondence in my office that he did so.—ED.

ABSTRACT OF BE-FLIES RECEIVED. Question VII.

Samples from Owalior and Poona compared.

Conf. Agricultural Ledger, 1894, No. 34.

Question VIII.

When fit for extracting fibre.

A, 631-35,

AGAVE sisalana*

Experimental Cultivation of

ABSTRACT OF RESULTS RECEIVED. Question VIII. Age at which the plants attain maturity.

years. Mr. Macgregor, Arrowah, Tirhut, says they after three or four years. Mr. Woodrow, Poona, believes years is about the time required to produce leaves fit to be cut received in 1892 are now (1898) beginning to send up new plants, indicating the attainment of full growth. Some are, however, not less than a year later. Mr. Gollan, Saharanpur, says they may be cut for experimental purposes within two years; for Dauracherra, Cachar, also says that the leaves are ready to be cut at the fourth year after planting, but adds that the fibre obtained will be short and not of such good quality as that of a year after planting. Mr. Peter, Mertinga, Assam, thinks probably five years after planting out is the most suitable time to begin cutting. Mr. Burnett, Tellicherry, is not prepared to say that in a definite time.

Question IX.

QUESTION IX.—How was the fibre prepared that was made from them?

Fibre from the plants now prepared.

At Poona the fibre was prepared tentatively by two methods: (1) hand-scraping with the edge of a piece of hoop-iron; (2) leaves were torn into shreds, dried in the sun, soaked for about 10 days, beaten and washed. At Saharanpur the fibre was extracted by hand. At Tellicherry it was obtained by scraping. Mr. Burnett has also soaked some of his leaves, but does not find much difference in quantity or quality of fibre. At Dauracherra, Cachar, the leaf is first beaten with a wooden mallet and then scraped with a sharp-edged piece of iron, washed and put in the sun.

Question X.

QUESTION X.—Has any commercial quantity of fibre been made from the Sisal Hemslant in India, say, a balsam, and with what result as to yield from giants, and how much obtained for fibre?

Commercial quantity. Question XI.

Not as yet apparently.

QUESTION XI.—Has their cultivation been attempted anywhere in India on a large scale for commercial purposes?

Cultivation of the plant on a commercial scale.

Madras.—Mr. Burnett, of Tellicherry, thinks that no attempt has been made in the Madras Presidency. On his own enquiry about land in which to grow the plant on a large scale, Mr. Burnett found that no large area of suitable quality was procurable, and the natives of his district are so anxious to invest in land that prices rule very high.

A* 631-35*

Ledger.

Sisal Hemp in India.	(D Prain.)	AGAVE sisalana.
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Bo., bay.-m. Wood X 'utst worked on commerce
 tionat Nandgaon, Western & **£,, from the Go***TM*
 lines M. Woodw *^jg5»**A " * S £ 1
 of Bombay to experiment with Sis*6 on village, 9 mile, south of
 Piece of very poor forest at N. f " Se village Ambowne. The
 Lanauli on the road from Unauli, to the ^ ^ ^ has teen
 are now 400 plants at that pla«. The labo s for protect ion agast
 sufficient only to plant and make fe-t«« plants at Poo™ ha^ve
 forest fires. Trees are left standmg. * the planted at Nan^dgaon
 begun to pole, a rapid increase in «e area planted

ABSTRACT
 OF RE-
 PLIES RE-
 CEIVED.
 Question XI.

Way be expected.

... n of sisal on an
 of
 In December 898, a ^ «J&S^*ZT~
 extensive scale, was projected, and t-n. Pa Ha pa k o m p a n y, W a -
 a Company, to be called the Bombay io o, o d o, and
 issued' The capital required > e S e r the Company h « j £
 Rs. io,000 has been subscribed. W u was proposed to ask
 successfully floated is not yet known. K h o o ^ r f f o t e s t and.
 Government of Bombay for a 1 ^ . ^ ' s ^ b a y Government has
 but it has not transpired whether * e ^ ^ ^ f o n n a l y m a d e .
 Sranted this request. or i n d e e d w l i ^ ^ ^ ^ ^ ^ e i y ;

^
 Cultiva
 on a c
 mercial
 scale.

Central India.—Mr. Marles, O. J. ...
 he knows of no other attempt

Central Provinces.—**0 «formation.

Panjab.—Ho information.

North-West Provinces.—" are of any attempt on a
 Mr. Ridley, of Lucknow, are unaw --r. ^ I U B thinks n o -
 scale in the North-West Proving says thete has been no
 attempt has been made, w o c k n o w i e n .
 demand for the plant from the LU Saran, knows of n o

Tirhut.—Mr. Macgregor of Arrawah, suggested a reference
 attempt M. Gollan, of Saharanpur, suggested a reference
 of this question to Mr. J. V. Webb, of Chitwarrah, but Mr. Webb
 has not replied to my reference. Messrs. Thomson & Mylne
 of Beha state that they we ^ of Rhea and Sisal, and
 Government to further the cu -inter-est in the endeavour of
 W occurred to them that the V -eparation L of the fibres might
 W made a domestic »cupa'» for ^ women and children
 of Brahmin and Rajput fam. Ues on the Jagdispur Esidate. The
 Plants being perennial could be cultivat ^ on the borders of

631-35.

AGAVE
sisalana*

Experimental Cultivation of

ABSTRACT
OF RE-
PLIES RE-
CEIVED.

Qvertion XI.

their fields, and with this idea the firm planted and cultivated patches of both plants to show the facility with which they could be grown and propagated by the men of the family. This was freely admitted by the men, but, as no result followed, the plants were reluctantly cleared from the ground.

Chota Nagpur.—/lr. Cooke, of Ranchi, thinks no commercial attempt to grow Sisal has been made, and, moreover, expresses his belief that it would not pay as an industry.

Chittagong.—k recent letter in the *Calcutta Englishman* &* states the establishment of the industry in Chittagong, from which I infer that so far it has not been attempted there on a large scale.

Assam.—The Manager, Pathecherra Estate, Cachar, thinks is being tried on a large scale at Manumukh by Mr. H ^ ^ Mr. Peter, of Mertinga, Manumukh, says that 20 or 30 acres n* , been put down, but that no fibre has yet been extracted. * . Jj Lawrie, of Lungai, Munshi Bazar, says that the largest P lant i o fe known to him is that at Dauracherra, the plants for which *c imported from Florida. He believes this plantation is meant for the production of bulbils, and as the plants have not been cut t n j ed are expected to pole soon, it will be seen from the list supp by Mr. Lancaster, Secretary to the Agri-Horticultural Soci < J that Mr. Lawrie himself is mentioned as having received fro j t b Society 50 plants on behalf of the Dauracherra Estate. t s * a plants were amongst those first distributed by Mr. Biectya? < n , Mr. Lancaster's predecessor, and were, therefore, almost cert e n ly part of the Bengal consignment of 1891 which Sir George * * ag imported from Florida. Mr. Lawrie's remark may, therefore, o n i have reference to these plants, though, as it stands, it may a l s b mean that the Dauracherra Estate has itself made a dire ct importation of young plants from Florida. . IS

[Since the foregoing pages were set up in type, The E ^ t o f * been favoured by Major Prain with copies of the appended cot r e s - pondence which explains itself.]

From—lh. A. G. Bourne, F.R.S., *Honorary Secretary, Agri- Horticultural Society, Madras,* . ic
To—Major D. Prain, I.M.S., *Superintendent \ Royal & * ted Gardens, Sibpur, Calcutta, No. 208, & ^ Madras, the 2nd February 1900.* / o f

In perusing your Bulletin No. 5 (Agricultural Series No- 4 J de 1899 about *Agave rigida var. sisalana*, I find no mention is **

A* 631-35.

Sisal Hemp in India.

(D. Prain.)

AGAVE
sisalana*

regarding our experiments and distribution of the plant. Mr. Bennett, of Tellicherry, is not quite correct in saying that there was no attempt made in Madras as you will find in reference to the Society's Proceedings, pages 16, 17, 104, 132 and 150 of Vol. 16 and 214 of the Plant pages 93 and 180 and 17 of the that 24 the Royal Gardens, Kew, in 1890, and the number was propagated by suckers and bulblets and that a large number about 3,000 was distributed to the following places:—

MADRAS.
Agri-Horticultural
Society.

(Correspondents and Members.)

- 2 plants to Tallapodi in June 1891.
- 2 „ Mysore Government Garden in May 1891.
- 27 „ Calicut in February 1896.
- (Through the Government of Madras in 1898.)
- 3,000 „ Cuddapah, Bellary, Anantapur, North Arcot and Madura.

We may mention that we have now a large stock to be disposed of by the Government for planters and ryots who may wish to establish estates. It flowers with us very well and produces thousands of bulblets in each flower spike.

From—Major D. Prain, I.M.S., Superintendent, Royal Botanic Gardens, Sibjur, Calcutta,
To—bt. A. G. Bourne, F.R.S., Honorary Secretary, Agri-Horticultural Society, Madras.

I am greatly obliged to you for your letter No. 208, dated 2nd February 1900, regarding the distribution of Sisal by the Agri-Horticultural Society of Madras.

I think I made it clear that, with a view to answering the questions put to me by the Government of Bengal, I issued these questions to all the parties who had to my knowledge directly or indirectly received plants of Agave sisalana from the Royal Botanic Garden. Two of these parties, the Superintendents of the Government Gardens at Poona* and at Saharanpur, had, like your Society, been themselves engaged in independent attempts to introduce the plant into India, and owing to the fact that they had likewise received plants from this institution, I was not aware of their own independent attempts. No plants having been sent from these gardens to your gardens it did not fall within the scope of my note to treat of what had been done by you, though I would certainly have gladly added to it a

A, 631-35-

AGAVE
sisalana*

Experimental Cultivation of Sisal Hemp in India.

MADRAS.
Agri-Horti-
cultural
Society.

reference to your work had anything occurred in the course of my correspondence with recipients of the plant to direct my attention to the references which you kindly quote. . . j

Although the note on Sisal has appeared as a *Proving Bulletin*, it has not, so far as I am aware, yet been issued as *Agricultural Ledger*, and in the hope that it has not yet issued in that form I am sending a copy of your letter, and my reply to it, to the Reporter on Economic Products to enable him to incorporate the interesting information you now give.

I may add, for your information, that since preparing my note I have learned that two private importations from Florida Sisal Hemp plants, one in the Tirhut (Indigo) area and the Assam (Tea) area, have taken place, the parties concerned have said nothing about these importations and all that I am able to say regarding them is that the efforts of the various Indian Governments detailed in my note on Sisal plus those of your Society and of the Government of Madras are, when put together, insignificant as compared with either of these private ventures.

A, 631-35.

A NEW BURMESE TIMBER-TREE.

A New Burmese Timber-Tree.

Among the many specimens kindly sent to the Calcutta Herbarium by Officers of the Forest Department at the desire of the Inspector General, in connection with an enquiry into the source of Padouk distribution of the various Indian species of *Pterocarpus*,—*n enquiry hand-
uncompleted because all the necessary material has not yet come to the most interesting happens not to belong to *Pterocarpus* at all. Lik
many of the other specimens sent, these are unfortunately incomplete, they have no flowers, and the leaves and fruit sent are not attached. The
were collected in Tenasserim by Mr. Hearsey, and forwarded by Mr. Hearsey to
Manson. There is, however, no doubt as to the genus to which Mr. Hearsey's
fruit belongs, and the leaves, though somewhat different from those of these
of previously known species of that genus, are sufficiently like them to
make it hardly doubtful that they belong to the tree with whose
Mr. Hearsey has associated them.

The genus to which the fruit belongs is the Leguminous *Pahudia* Miq., founded by its author on a Javanese timber-tree, *Pahudia javanica*
Miq. {*Flor. bid. Bat. i. pt. i, 85* [1855]}, first collected in 1880 by
Horsfield, and excellently characterised in its original definition. *Retsia*
as an afterthought, added a second species in the same work (*Pahudia*
P. Hasskarliana, based on the description given by Hasskarl (*Recht*
*99) of *Jo?tesia monopetala*. To provide room for this species, *Miq*
had to modify his original diagnosis very considerably; so considerably,
in fact, that Bentham (*Genera Plantarum* 1. 580 [1865]) has not
it in the genus, and Kurz (*fount. As. Soc. Beng. xlv. pt. 2, 290* [1877])
has had to point out that it cannot be congeneric with the original *Paku*
From the description given of its pod, Kurz would refer *P. Hasskarliana*
to the genus *Macrolobium*; Koorders and Valetton, however, *beir*
and in all probability correctly (*Bijdr. pt. 2, 27* [1895]), that *it is only*
Afzelia bijuga A. Gray. At the same time, however, Koorders and *Val*
suggest that the species known as *Afzelia coriacea* Bak. (*Intsta c*
Maing.; 0. Kuntze) be referred here. They are undoubtedly *ori*
their belief that this species cannot possibly belong to the genus in *ct i*
Baker and Kuntze wish to place it. It is not, however, a *ran*
more than it is an *Afzelia* (*Intsia*), but is a *Sindora* (*Craledupa*).

Ballou (Histoin des Plantes n. 112 [1869]) would include *Pahudia* as a whole in *Afzelia* (*Intsia*): the pod and seed are, however, so different from those of the Indian *Azdias** that this character, added to the distinctive one obtainable from the stamens—monadelphous in *Pahudia*, free in *AfitoHa C/ntsiaJ—Tenders* it more convenient to recognise *Pahudia* as a & enus apart. Taubert, in Engler's *Naturlichen Pflanzfamilien* in., pt. 3> 141 [1894], omits to notice that *P. Hasskarliana* cannot belong to the genus, or to notice the still more important fact that there is really another species, *P. xylocarpa* Kurz (*fount. As. Soc. Beng.* xlv, pt. 2, 290 j. 87 G J), founded on specimens collected by Teijsmann in Siam. Kurz had the Rethought to provide Forest Officers with an account of this species (*Forest Flora, British Burma* 1., 413 [1877])—aforethought now wholly justified, because the tree has recently been found in the Southern Shan States. It is remarkable that, like Taubert, Koorders and Valetou have also overlooked the existence of this Siamese species.

In Mr. Hearsey's tree, which, from his account of it, must be a very fine one, we have now a third species of *Pahudia*. He speaks of it as having a trunk 10 feet in girth, capable of yielding planks 20 feet long. The Burmese name for the tree is Pyin Padouk, but, as Mr. Hearsey says, it is neither the one nor the other." The fresh seeds are worn as necklaces by the wild Siamese on the frontier.

As the genus finds no place in the *flora of Brühl's Indm* one has to turn to Kurz's & eneri c description in the *Forest Flora*, which is excellent. As Kurz's work is accessible to all Burmese Forest Officers, it is not necessary here to do more than give a brief diagnosis of the genus, with a key to the species and a note of their hitherto recorded localities.

PAHUDIA Miq.

Flower unarmec* timber-trees; leaves even-pinnate, leaflets few, papery; petals 5 facemose or panicled; calyx 4-partite, lobes decussate-imbricate; ab. solitary stamens monadelphous in a slit sheath, filaments 7, free above with 2 small staminodes at base of sheath; ovary stipitale; pod 1 6, oDiong, thickly woody, 2-valved, septate and spongily pulpy within; seed with a large, basal, strophiolate or arillate funicle.

The African species on which the genus *Afzelia* was originally founded by Smith in *Lim, Soc iv, 221 C 79 B* which, though included in *Intsia* by Taubert, is admitted by the *Pe* of a distinct section *Afroidsia*, has a pod and seed quite like those of *Pahudia* and differs only in having three petals (two of them quite small) and in having instead of united filaments. My own belief is that the union of *Afzelia* and *Pahudia* is quite called for, and that if any rearrangement is required it ought to take the form of a fusion of the genuine *Afzelia* with *Pahudia* and perhaps the association with *Sindora*, which is the true *Galedupa*. This, however, would involve such an alteration of names in the group to which all of them belong that I do not care to insist on the measure in this note.

Key to the species.

Arillate funicle prolonged upwards on the front and back of the seed; seed slightly compressed antero-posteriorly so that transverse axis lies across the pod; leaflets 4-5-jugate, subequal or ovate or oblong, base rounded or slightly cordate, somewhat not glaucous beneath

Arillate funicle with a horizontal edge, not prolonged upwards on front and back of the seed; leaflets quite glabrous, glaucescent beneath

Seed slightly compressed antero-posteriorly so that the long transverse axis lies across the pod; leaflets 4-jugate, oblong, unequal-sided, base cuneate or rounded...

Seed much compressed laterally, so that the shorter transverse axis lies across the pod; leaflets 2-3, rarely 4-jugate, unequal-sided, base rounded or slightly cordate

1. *Pahudia javanica* Miq. *Flor. Ind. Bat.* 1.1, 86 (1855) > *As. Soc. Beng.* XLV. 2, 289 (1876); *Koord. and Valet. Bijdr.* 11. & v MALAY ARCHIPELAGO; Java, *Horsfield!* *Koorders!*
Leaflets 4-8 cm. long, 2*5-4.5 cm. wide; *pod* 7-10 cm. long, 5.7 cm. wide, 4 cm. thick, 3-8-seeded; *seeds* 28-33 mm. long, 16-22 mm. thick.

2. *Pahudia martabanica* Prain.
 INDO-CHINA; on the Tenasserim river, between Sinbyaung Aungthawara, *Hearsey!*
Leaflets 10-12 cm. long, 6-7 cm. wide; *pod* 20 cm long, 5 cm. wide, 5 cm. thick, 8-10-seeded; *seeds* 36-40 mm. long, 16-18 mm. thick.

As regards its foliage this approaches most nearly to *P. xylocarpa*, the leaflets being quite glabrous and glaucescent beneath; in shape the leaflets are unlike those of either of the other species. As regards the larger than in either of the other species, and its seeds, while they most closely those of *P. javanica* in shape, differ from these as regards the funicle, which is very like that of the seeds of *P. xylocarpa*.

3. *Pahudia xylocarpa* Kurz, *Journ. As. Soc. Beng.* XLV/ (1876); *Kurz, For. Flor. Brit. Burma.* 1. 413 (1877); *Prain, Soc. Beng.* LXVI. 2, 494 (1897).
 INDO-CHINA; Siam, *Teysmann!* Southern Shan Hills, *King! Collector!*
Leaflets 7-8 cm. long, 5-6 cm. wide; *pod* 10-12 cm. long, 6-7 cm. wide, 4 cm. thick, 2-3-seeded; *seeds* 33 mm. long, 25 mm. wide, 15 mm. thick.
 The laterally compressed seeds at once distinguish this from the other two species.

D. PRAIN.

XIII. *the Asiatic species of ORMOSIA.*—By D. PRAIR.
1900.]

On two previous occasions the communication (N.O. leg.) the book representing at least three new forms from the described forms two new species, and the presence of the requisite among Chinese collection), it may therefore be as well to give at the same time a key to all the known Asiatic species as a preliminary to an exhaustive monograph of the genus.

According to Hooker and Jackson, the name *ORMOSIA* Jacks. is more familiar use it is convenient to retain it. or more species of *Ormia* have from time to time applied to *J. J. LOBIUM* Miq., and, in the These are *IUTU* Hook, and *Am.*, these tentatively water's opinion, *ARIUAR* Kurz. - 10 - DeCandolle to include two added *MACROTBOPIS* DO.,⁸ a genus founded by plants from S. China and Cochin China of Linnaeus. This tentative *Wr.* as opposed to the true *Anagynthe Index* redaction has been formally accepted in *el* Lom.eiro tells us, is in his acceptable to the writer because the is not a fact to modern two species longer than the standard; *nn* to modern *Omoifu* and as neither of *Loureiroa* *P^{lan}arate*. These objections, students it is better to keep *MACROIROPIS* Miq. (not of however, do not apply to the reduction of two species which **>.**) In the first *Miquel* in dealing with the two referred to *Maerotropis* found it necessary by having the wception a new section *Amaerotropu*, say hftd to standard as long as the other petals, that of *Ko6ro(re)Pis* abandon the character that is most **>bl** in the genus. In the fore he could accommodate his two species *Miquel's* plants in second place there are authentic examp.

Herb. Calcutta and both are true *Ormow*—

¹ J.A.S.B. kTi. 2,146 and 467 (1899).
² *Index Kewensia* ii. 367.
⁸ *Adans. Fam. it* 826 (1763).
 * *Jaoksoa* in *Trans. Linn. Soc.* 1.880 (1833).
 > *Hooker and Arnott, Boh Beech. Voy* S, t. 38 I
 * *Miquel, Jlor. Ind. Bat. Suppl.* 302 (1880).
^T *Kurz, JA.SB.* xlii.2.70 (1875).
 * *DeOandolle, Prodr.* ii 98 (1825).
 > *Uureiro, Flor. Cochin-OWn.* 260 (17W
¹⁰ *Miquel, Flor. Ind. Bat. Sappl.* 29* (1860).

ARILLARIA Knrz, has not been accepted as a valid genus⁷ or by the editors of the *Index Kewensis*. The species on which it was founded was treated by Roxburgh,⁸ who has left a coloured figure³ and in discussing it has suggested that the plant is nearer *Ormosia* than to *Sophora* but that, owing to its having a fleshy pod, perhaps a distinct genus. This genus he refrained from founding the account given by Roxburgh of the arillus was not clear to Kurz has confirmed and amplified Roxburgh's account of the arillus and has therefore provided the generic description that Wight did not venture to give. Taubert has adopted Kurz's genus, though his attitude may require to be discounted to some extent, for he at the same time retains among the *Ormosias* the species on which *Arillaria* is based. In spite of the views expressed by Wight, Kurz and Taubert the writer agrees with Baker and Baillon⁶ in thinking that the species may well be accommodated in *Ormosia*, though he nevertheless retains the characters of the species (*Ormosia robusta*) are such as to entitle it to the rank of a subgenus.

Bentham⁵, for convenience, divided the Brazilian species of the genus into two groups,⁶ *Gonrolares* or species with the leaflets to the naked eye on both sides except perhaps, the midrib, and with leaves not much paler beneath than above, and *Discolares* with the leaflets paler beneath and there manifestly puberulous, silky or tomentose. Baker has also, in essence, adopted this method of subdividing the genus and Taubert has even formally adopted Bentham's groups as sections and applied them to the whole genus. This subdivision, however, does not always permit species that are naturally closely related to remain together and it is not improbable that a classification which is based more on the characters derived from fruit and seed and less on characters obtained from the shade of green and the degree of tomentum on the leaves will in future be found more satisfactory.

Below, a purely tentative scheme of classification is briefly sketched:—

- Pod with woody valves; seeds scarlet, with or without a black spot on hilum, not enveloped in an aril; Sbn-gen. TOULTCHIBA.
 Leaf-rachis bearing at its tip the distal pair of leaflets as well as the leaflet; Sect. CH-ENOLOBIUM.

1 Hooker, *Flor Brit. Ind.* ii. 252 (1878).
 * Roxburgh, *Hortus Bengalensis* 31 (1814).
 8 Wight, *Icones* t. 245 (1840).
 4 Engler *Natürlich. Pflanzenfam.* iii. 3. 194 (1894).
 6 Baillon, *Hist. des Plantes* ii. 362 (1869).
 * Martius, *Flora Brasil.* xv. 1. 315 (1862).

Longer prolonged beyond the distal pair of leaflets to support the terminal one 5 Sect. *ORMOSIA* proper.

Pods with thickly woody valves not septate between the large seeds which are usually solitary; Sub-sect. *Macrodisca*,

Pods with thickly woody valves septate between the small seeds which are usually several; Sub-sect. *Layia*.

Pods with thinly woody valves and usually solitary always small seeds; Sub-sect. *Amacrotropis*,

Pods with fleshy valves seeds black, enveloped in a fleshy arillas; Sub-gen. *ABILLAUIA*.

The Asiatic species of which sufficiently complete material has been reported should be distributed as follows among these groups:—

I. *TOULICHIBA*.

* *CHENOLOBIUM*. *O. pachycarpa*, *O. venosa*, *O. decemjuga*, *O. septemjuga*, *O. polita*.

* *ORMOSIA* proper.

(a) *Macrodisca*. *O. macrodisca*, *O. gracilis*, *O. travancorica*.

(b) *Layia*. *O. emarginata*, *O. Henryi*, *O. inopinata*, *O. laxa*, *O. glauca*, *O. Balansae*.

(c) *Amacrotropis*. *O. microsperma*, *O. parvifolia*, *O. sumatrana*, *O. yunnanensis*.

II. *ARILLAJA*. *O. robusta*.

The other species given in the subjoined key, which is more or less artificial in detail, are species of which the fruit is not known. In the account of *Ormosia* given in the Society's *Journal*, a previously undescribed species was there named *O. nitida*. However, a prior *O. nitida* Vogel,¹ which stands good; it has therefore been necessary to re-name the Malayan species.

Key to the Asiatic species of *Ormosia*.

Erect trees:—

Pods with fleshy valves; seeds with complete arillas;

leaflets glabrous beneath x. *robusta*.

« With woody valves :-

Seeds with a black adnate basal arillus, leaves minutely sparsely pubescent underneath :—

Panicles fastigiate, flowers white; pod 8 cm. wide;

seed 2-5 cm. long 2. *macrodisca*,

Panicles lax, flowers yellow; pod 3 cm. wide; seed

2 cm, long 3# *gracilis*.

Seeds with a uniform pink tasta and no arillus :—

Leaflets beneath glabrous OT only downy along the midrib:—

Leaflets 3-5 :—

Calyx glabrous; leaflets obovate-oblong obtuse or emarginate, base cuneate; stamens 9 ..•

5. *emarginata*.

CaTyx pubescent; leaflets elliptic-oblong obtusely acuminate, base rounded; stamens 5 ...

4. *semicastrata*.

Leaflets 7-9; base rounded ; calyx pubescent:—

Leaflets narrowly oblong; rachis prolonged beyond distal pair of leaflets :—

Leaflets dark green gradually narrowed to an acute point

6. *calavensi**.

Leaflets pale grey-green, caudate-acuminate:—

Pod broadly oblong, 5-6 cm. long, 3.5 cm. wide, seeds large 2.5 cm. long

7. *travancoric**.

Pod narrowly oblong, 5-7*5 cm. long, 3 cm. wide; seeds small 1 cm. long ...

8. *glauca*.

Leaflets broadly oblong, apex rounded or shortly abruptly cuspidate; rachis bearing distal pair of leaflets, as well as the terminal leaflet, at its tip*

18. *polita*.

Leaflets beneath more or less persistently hirsute or velvety:—

Leaflets with distinct petiolules and the leaf-rachis prolonged beyond the distal pair of leaflets :—

Pod large with thickly woody flattened valves; pedicels long, 3rd to quite as long as calyx:—

Pods narrowly oblong, 6-7 cm. long, 2*2.5 cm. wide, seeds 1*2.5 cm. long or less :—

Leaflets 7-9, thickly coriaceous, glabrous above, densely velvety beneath ...

9. *Henryi*.

Leaflets 15-17, chartaceous, deciduously puberulous above, softly pubescent beneath

12. *laza*.

Pods broadly oblong, 5-6 cm. long, 3.5 cm. wide ; seeds 1*5 cm. long or longer; leaflets 7-11, rarely 5 :—

Pod glabrous; racemes even in fruit much shorter than the leaves:—

Corolla pink, leaflets persistently pubescent beneath

10. *inopinata*.

Corolla yellow, leaflets glabrescent with age

10b. *inopinata*
VAR. *dubia*.

Pod pubescent; racemes in fruit as long as the leaves

11. *Balansae*.

Pod small with thinly woody convex valves, 1*5 cm. wide; pedicels less than half as long as calyx:— *

Leaflets small, 6 cm. long or shorter, 9-13,

shortly acuminate

“

“ 17. *parvifolia*.

- Leaflets large, 10 cm. long or longer:—
 Leaflets thinly pubescent beneath j panicles
 lax, bracts small:—
 Leaflets 7-9, rarely 5, ovate, obovate or
 elliptic, pale-green ... 14. *sumatrana*.
 Leaflets 13, narrow oblong dark-green ... 15. *yunnanensis*.
 Leaflets densely pubescent beneath, dark-
 green, 11-13; panicles fastigiate, bracts
 conspicuous:—
 Pod glabrous ... 16. *microsperma*.
 Pod hirsute ... 166. *microsperma*
 VAE. *Bidleyi*.
 Leaflets with short petiolules or subsessile, leaf-rachis
 bearing at its apex the distal pair of leaflets as
 well as the terminal leaflet: -
 Pod with thinly woody valves, 2-2*5 cm. wide :—
 Leaflets 13-15, ovate-acnto ... 19. *septemjuga*,
 Leaflets 19-21, lanceolate acuminate ... 20. *decemjuga**
 Pod with thickly woody valves, 3*5 cm. wide; leaflets
 ovate oblong:—
 Leaflets abruptly shortly cuspidate; pod persis-
 tently woolly ... 21. *pachyoarpa**
 Leaflets obtuse or subobtuse j pod glabrous ... 22. *venosa*.
 Climber; leaves glabrous beneath, dark j-green ... 13. *scandens*.

OEMOSIA JACKS.

Subgenus I. **ARILLARIA** Kurz (~~in genere~~) *Journ. As. Soc. Beng.* xlii. 2. 71.

1. ^{ORMOSIA} ^{WB&STA Baker in nook, fil. Flor. Brit. Lid. ii. 252 (1878) ;}
^{h- in Bngl Naturl Vflwzwfam. iii. 3,194 (1894).} 0. *floribunda* Wall
^{Cl 37 (1832), Sophora robusta Boxb. EorL Beng. 31 (1814) J Wight}
^{Icones t. 245 (^840). Afillaria robusta Kurz Journ. As. Soc. Beng. xlii. 2.}
^{71 (1873) and xlv > 2 > 2A ^1876^ and For, Flor, BriL Burma { 334}
⁽¹⁸⁷⁷⁾

As: AM ^{Taub. in Engl Naturl. Pflanzenfam. ,iii. 3. 196 (1894).}
^{Collecto S ; Brahmaputra Valley, near Jnt of Akha Hills, King's}
^{5337) ! r! Silhet » Roxburgh (Ic in Herb., OaMttal) DeSilva {Wall JJat.}
^{Fulcone CnirrAGONG; Kodala Hill, King's Collector! BURMA; Amherst,}
^{r / Rangoon, Kurz! Pegu Yomah, Kurz!}

§ « bgenus 2. **Touii** CHINA Adans. (prd%enere) *Fam.* ii. 326 (1763).
 Afil 1). ^{UOfiMOSIA} **OfiMOai** Jacks, (geuus) *Trans. Linn. Soc.* x. 360

T ^ACRODISCA.
^{2< °RMOSIA MACRODISCA Baker in Uook. fil Flor. Brit. Lid. ii. 253}
^{(1878) J Prnin, Journ. As. Soc. Beng. lxvi. 2. 148 and 467 (1897).}
 MALAYA* PENINSULA ; Malacca, Maingay ! Singapore, Bidley !

3. OKMOSU GRACILIS Prain, *Journ. As. Soc. Beng.* Ixvi. 2. 1⁴⁰ and 468 (1897).

MALAYAN PENINSULA ; Perak, *Scortechini! Kunstler! Wray I*

4 OBMOSSIA BBMIOASTRATA Hance, *Journ. Bot. xz.* 78 (1882); ⁷⁷ *Forbes* *fy Hemsl. in Journ. Linn. Soc.* xxiii. 204. (1887).

CHINA J Hongkong, *Ford, fide Hance.*

This species is not yet represented in Herb. Calcutta.

5. ORMOSIA EMARGINATA Benth in *Hook. Kew. Journ. ir.* ⁷⁷ (1852), and *Flor. Hong-Kong.* 96 (1861); *Forbes & Hemsl. in Jon** ⁷⁷ *Ui* ⁷⁷ *Soc.* xxiii. 204 (1887).

CHINA ; Hongkong, *Ford!*

6. ORMOSIA CALAVENSIS Azaola in *Blanco Flor. Filip- ed.* ² ¹¹³ (1845) *i Vid. Sinops. t. 41, f. H(1883) and Rev. PI Vase. Fib?* (1886).

PHILIPPINES ; Luzon, *Quming 1219! Alabat, Tidal 2617!*

Vidal y Soler suggests that this is the same as *Ormosia* (*Arillaria*) ^{rot} ^{na} ^{gfl} & the suggestion can only be explained on the assumption that Sen. Vidal ^{na} ^{^^} specimens of *O. robusta* before him. There are no figures of this species ^{afe} ^{rfe} ^j Calcutta; if their structure is like that of *O. robusta* this species must be transferred to the subgenus *Arillaria*.

7. OBMOSSIA TRAVANCORICA M. *Flor. Sylvat. i. t. 45* (1869) ^{Baker} in *Honhfil. Flor. Brit. Ind.* ii. 253 (1878).

S. INDIA; S. Canara, Tinivelly, Travancoro, *Beddome (Ic)*

This species is only represented in Calcutta by Beddome's figure.

⁷⁷ LAYIA ^{zoo} ^{fc} ^J ^{iln} ^T ^{PF} ⁰ ^{genere}) ^B ^{ot} ^B ^{ee} ^{h.} ^{Voy} ^u [>] (1833),

8. OUMOSIA GLAUCA Wall. *Plant. As. Bar.* ii. 23. t. 125 ^M (1831) and ¹⁸⁷⁸; ⁵³³⁸ (1832); 5 ^{akr} in ^{ilbo} ^{fe} [>] ¹ ^J ^{Vor.} ^{Brit. Ind. il} 253 (1896); ^{Gambie} ^{Afc} ^{m.} ^{Inri.} 2 ^{Vm} ^{6.} xvii. (1881) and *Darjeel List*, Ed. 2. 30

Protn, Jbtira. ^{^^} *Soc. Beng.* Ixvi. 2. 467 (1897).

NEPAL; Sonku, *Wallich!* SIKKIM ; Sivoke, 2500 ft., *Gamble!* ⁷⁷ ^{ti} ^y

9. ORMOSIA HENRYI *fyin*; leaflets 7-9, oblong, pale green; ^s ^{^^} [^] staled, thickly coriaceous, glabrous above, velvety beneath, ped* ^c long as the calyx, pod narrow oblong, valves thick woody.

CHINA ; Hupeh, *Henry 777!*

A tree, with tawny-velvety branches. *Leaflets* usually 7, oblong lanceolate [>] ^{pie} ⁻ firmly coriaceous, 8-10 cm. long, 3-4 5 cm. wide, quite glabrous above, dense ^{bw} ^h [^] buff velvety beneath, ^{aj} ^{ex} ^{acnte}, base rounded, veins 8-9 pairs slender, some ^{tawny} prominent beneath; petioles 5 mm. and main rachis 8-9 cm., closely shortly ^{ye} [^] pubescent. *Flowers* in axillary racemes 8-9 cm. long, tawny pubescent ^{ns} ^a ^{mm.} pedicel 1.25 cm. long, bracts and bracteoles deciduous. *Calyx* campanulate ^o ^{m.} long, silky. *Corolla* and *Stamens* not seen. Pod hard thick, 6-7 cm, long* ^{2,6C}

wide, the black, smooth externally, slightly swollen opposite thoripo seeds,
 along side the upper suture, seeds 2-5, bright scarlet, small, 1 cm.
 end of the pod in which they are embedded, with no trace of arillus.
 0- jfauca Wall, but differing greatly in the velvety under-surface of the
 leaf.

10. *OKMOSIA INOPIXATA* Ptain; leaflets 9, less often 11 or 7, rarely
 5, ovate acuminate, beneath softly closely tawny pubescent on the mid-
 rib and veins, elsewhere sparsely pubescent, leaf-veins and branchlets
 velvety beneath prominent finely reticulate, large, distinctly
 stalked pedicels long; pod compressed with thick woody valves.
 VAR. *TYPICA*; corolla reddish, leaflets persistently pubescent.
 JUCHIN HILLS; Bansparao, near Sadon, *Praia's Collector!*

A large tree, branchlets dotely tawny-velvety sulcato branches. *mmjlets* rigidly
 coriaceous 15-16 cm. long/5-6'5 cm. (the terminal leaflet sometimes 8 cm.) wide,
 with midrib at first pubescent at length quite glabrous, rather pale-green
 beneath persistently tomentose but the tomentum sparser with age, veins
 pairs prominent beneath with a fine secondary reticulation visible also above
 especially on the leaves, apex abruptly acuminate, base cuneate or rounded
 petiolules 6 mm. and leaf-rachis 22 cm. long, closely velvety. *Flowers* in axillary
 or few-branched panicles 20 cm. long, closely velvety as are the pedicels
 Calyx 9 mm long, closely velvety both externally and within, teeth
 rather longer than the tube. *Corolla* reddish, twice as long as
 the calyx, usually 9, all fertile, anthers oblong *vamtil^Wanj* sub-
 glabrous except for a few hairs on the dorsal and ventral
 Pod flat, glabrous, filiform, tip circinate; stigma oblong; ovules 4 or 3.
 feintly reddish with woody valves, 6 cm. long, 3 cm. wide, 1/25 cm. thick, with
 stipe between the 3 or 4 seeds, obliquely ovate-oblong, with a distinct
 diagonal axis remote from stipe, ventral
 Parallel ridges 3 mm. apart projecting beyond level of line of
 seeds with a small white hilum and no arillas, ovate, 15 cm.
 1 cm. across: sometimes slightly compressed and only 7 mm. thick.

106. *VAR. DUBIA*; flowers yellow, leaves glabrescent with *ago* on
 under surface.
 Kani Hills; Bomkatom, between Lashio and Sadon, *Praia's*
Collector!

A large tree, branchlets faintly sulcate. *Leaflets* rigidly subcoriaceous 6-10
 cm. long & 3-4.5 cm. wide, the terminal leaflet almost 5 cm. wide, light-green, glabrous
 shining above, pale beneath very sparsely persistently pubescent, veins 7-9 pairs
 prominent beneath as is the fine secondary venation which is hardly visible above,
 apex acuminate, base cuneate or rounded petiolules 6 mm. and leaf rachis 15 cm.
 long beneath at first pubescent at length glabrous. *Flowers* in axillary racemes about 8 cm.
 long & rachis finely velvety as are the pedicels 0 mm. long not elongated in fruit.
 Calyx campanulate closely velvety both externally and within; teeth wide-triangular,
 rather longer than the tube, *Corolla* yellow with white, twice as long as calyx.

Stamens and ovary as in O. inopinata. Pod hard flattened, with woody valve 5 cm. long, 3 cm. wide, 1*25 cm. thick, somewhat swollen opposite the 1-2 seeds, with distinct stipe 6 mm. long and a prominent tip at apex of vertical suture projecting from stipe, ventral suture with blunt parallel ridges 6 mm. apart and a ridge beyond level of line of dehiscence; seeds cinnabar-red with a small white arillos, 1*25 cm. long, 1 cm. across, 8 mm. thick.

The foliage of the two trees here treated as varieties of one species is distinguishable and the structure of their flowers is identical. The collector who has communicated the specimens of both states, however, identifies the differences in colour of petals and in shape of pods and seeds, the trees as they grow look very different. If this should turn out to be the case it may be necessary to treat the variety here described as a distinct species, to be known as *Ormosia*.

11. ORMOSIA BALANSAE Drake del Castillo, *Journ. de Botan.*

(1891).

TONKIN ; near Ta-pliap, in forests, *Balansa* 2178.

This species is not yet represented in Herb. Calcutta.

12. ORMOSIA LAXA Train; leaflets 15, less often 17, lanceolate beneath and leaf-rachis and branchlets velvety, vein inconspicuous, medium, distinctly stalked; pedicels long. *lanceolate beneath*

KACHIN HILLS; Shan Buxtear Sadon, 5000ft., *Trains*

A tree, with tawny-velvety branches. *Leaflets* lanceolate, long, 2-5 cm. wide, at first finely deciduously puberulous above, densely velvety beneath. *Bladder* not prominent beneath, are 6-6 pairs, tapering from the middle, base cuneate in the lower fourth; petiolules 5 mm. in rachis 20 mm. long, densely tawny-velvety. *Flowers* in axillary few-branched panicles 8-12 cm. long, densely tawny-velvety as are the panicle 125-165 cm. long, bracts and bracteoles minute, deciduous, velvety. *panicle* densely tawny-velvety outside, finely pubescent within, 1 cm. wide-triangular almost as long as tube. *Corolla* twice as long as calyx usually 5 fertile exerted in the open flower, sometimes 6 or 7, rarely 8 or 7 fertile then with 3, 2, or 1 staminodes, always 2 stamens quite anthers oblong, versatile. *Ovary* stipitate, silky with long tawny hairs on the sutures; style glabrous filiform, tip circinnate, stigma oblique 6-7 cm. long, 2*5 cm. wide, the valves black, smooth externally, opposite the ripe seeds, very faintly ribbed alongside both sutures; seeds scarlet, 1 cm. long, 8 mm. wide, 6 mm. thick, separated by partitions of woody endocarp in which they are embedded, with no arillus. *lanceolate beneath*

This very distinct species cannot be confounded with any of the described *Ormosias*.

13. ORMOSIA SCANDENS Prain, *Journ. As. Soc. Beng.* lxxvi. 2, 467 (1897).

MALAYAN PENINSULA ; Perak, *Kunsler!*

This species is distinguished from all the others by its climbing habit; its fruit is not yet known its precise systematic position cannot be positively stated. It occurs, however, as if it might prove to be a species of *Layia*. It is *lanceolate beneath*

Ultimately found advisable to subdivide § *Layia* into two groups; those with thick-walled short pods, going into one and those with thin-walled short pods being placed in the other.

f i t AMACROTROPIS Wq. (pro sectione) *Flor. Lid. Bat. Snppl* 294 (1860).

14 ORMOSIA SUMATRANA *Prain, Journ. As. Soc. Beng.* lxvi. 2, 150 and 469 (1897). *Macrotropis suraatrana Uiq. Flor. Lid. Bat. Snppl.* 291 (1860).

MAUT ARCHIPLAGO; Sumatra, *Teysniann* 3618! *Forbes* 2592! 2648!
MALAYAN PENINSULA; Malacca, *Eolmberg!*

15. ORMOSIA YUNNANENSIS *Prain*; leaflets 13, short-stalked; veins beneath distinctly raised, pedicels shorter than the calyx, pod sub-oppressed with thin valves, seed ovate; racemes in rather close panicles.

CHIKA; Yunnan, mountains in western Szemao, 5,000 ft. elev., *Henry* 11,967!

A small tree 20 ft. high, with rusty-pubescent branches. Leaflet, ovate-lanceolate, firmly coriaceous, 10 cm. long, 3 cm. wide, glabrous above, softly sparsely pubescent beneath, veins about 10 pairs, primary veins about 10 pairs, secondary veins about 10 pairs, tertiary veins about 10 pairs. Petiole not visible above, apex acute with a short finely acuminate, submucronulate tip. P. base shortly cuculate, petiolules 3-5 mm. and rachis 16 cm. long, rusty-descent. Flower* in axillary branched panicles 14 cm. long, rusty-pubescent, as are the pedicels 2 mm. long, bracts and bracteoles ovate, 2.5 mm. long, 2 mm. wide, deciduous, rusty pubescent. Calyx campanulate, rusty-pubescent both outside and inside, 8 mm. long, teeth triangular hardly as long as the tube. Corolla and style not seen. Pod subsessile, irregularly orbicular, 1-seeded, oblong if inflated, with a broadly triangular unilateral tip, 2.5-3.5 cm. long, inflated between the seeds, valves thin, woody, rigid, black, glabrous, swollen opposite the seeds; seeds 1 or 2, bright scarlet, 8 mm. long, 6 mm. wide, 5 mm. thick, with white hilum and no arillus.

This species is most nearly related to *O. sumatrana*, its point of interest lies in being the most northerly representative of the *f Aniaerotropis*, all the other members of which are Malayan.

16. ORMOSIA MOKOMMA *Baker in Eooh.fil Flor. Bf^d.n.25S* (1878); *Prain Journ. As. Soc. Beng.* lxvi. 2, 151 and 469 (1897). *P. coarctata [Benth. Mss.] Kurz, Journ. As. Soc. Beng.* xln. 2, 71 (1871) in part, not of *Jacks*.

MALAYAN PENINSULA; Malacca, *Griffith! Uamgayl Berry I Perak, Kuntze!*

166." VAR. RIDLEYI *Prain, Journ. As. Soc. Beng.* 2. 150 and 469 (1897).

MALAYAN PENINSULA; Singapore, *Ridley!*

This "variety" is probably unrelated to specific *rauk*.

17. *ORMOSIA PARVIFOLIA* Baker in *Hook fit. Flor. Brit. Ind.* 25³ (1878); *Train, Journ. As. Soc. Beng.* lxvi. 2. 149 and 469 (W⁷> *Macrotropis? bancana* Miq. *Flor. 2nd. Bat. Suppl.* 295 (1860):

MALAY ARCHIPELAGO; Borneo, *Kaviland.* 57! Bangka, *Teysmann* 3405! MALAYAN PENINSULA; Singapore, *Bidky* 5929! 8096! Pah^{»»gi} Efc% 1267! 5013! Malacca, #ri\$/i/ Maingay! *Goodenough!*

Besides being a very well characterised species this ia much more widely distributed than most of the *Ormosias*. An authentic specimen oi * Baker's *Afacropis f bancawa* in Herb. Calcutta shows that it is tho same thing as *Ormosia parvifolia*. If the rule that the oldest specific epithet must under circumstances be conserved is to be rigidly applied, then Mr. Baker's namo m abandoned in favour of the name *Ormosia bancana*.

§§ *GENOLOBIUM* Miq. (pro genere) *Flor. hid. Bat. Suppl.* 302 ^{0: J]}

18. *ORMOSIA POLITA* Train. *O. nitida* Train, *Journ. As. Soc.* lxvi. 2, 149 and 488 (1897) *not of Vogel*

MALAYAN PENINSULA ; Perak, *Kunstler!*

When a description was given of this very distinct species the fact wa looked that there is already an *Ormosia nitida* Vogel, from Brazil j the therefore be replaced by another. This particular species is unlike *Clixnobia* is having perfectly glabrous dark-green shining leaves, and it m resembles the Malayan, as opposed to the Indo-Chinese *Layise* in having sma It also differs from the other *Chsenobia* in having well developed petiolu agreement with *Chxnolohiwm*, lies iu the fact that the loaf rachis is not, pr beyond the last pair of leaflets which are attached along with the terminal

19. *ORMOSIA SEPTEMJUGA* Train, *Journ. As. Soc. Beng.* lxvi. 2. 403 (1897). *O. coarctata* Kun, *Journ. As. Soc. Beng.* xlii. 2. 71 (I⁸⁷²> *parf*, «of o/ *Jacfts*. *Chaeulobium septemjugum* Ifig. *Flor. l* ⁴⁰³ *Suppl.* 302 (1860).

MALAYAN ARCHIPELAGO; Sumatra, *DiepenJarst* 2547!

An authentic specimen of Miquel's plant is preserved in the Calcutta Her a

20. *ORMOSIA DKCEMJUGA* Pmi», *Jbum.* -4s. 6oc. *Beng.* lxvi. -- (1897). *Chacnolobium decemjugura* Miq. *Flor. Lid. But. Suppl.* 302 (1860). *O. coarctata* Kurz, *Journ. As. Soc. Beng.* xlii. 2, 71 (1872) in *2?ar^, not of Jacks.*

MALAYAN ARCHIPELAGO ; Sumatra, *Teysmann* 3715!

An authentic specimen of Miquel'a plant is in Herb. Calcutta. Tins si shows, in my opinion, that Kurz was not justified in supposing that this is t he sanu aB *Chenolobium septemjugum* and that further ho was not justified in beli«v» e either this or *C. seplemjugum* is the same as *Ormosia microsperma* which he sopP to be the same thing as *O. coarctata* Jacks., a Guiana species.

21. *OEMOSIA PACHICARPA* Champ, ex *Benth.* in *Hook. Keio Journ.* iv. 76 (1852); *Benth., Flor. Hong Kong.* 96 (1861); *Forbes If Hemst.* iu *Journ. Linn. Soc.* xxiii. 204 (1887).

CHINA ; Cauton, *Reeves*, *Hong-Kong*, *Lamont*, *Champion*, *Ford.*

Various specimens were found at Canton as well as by the collector in Hong-Kong. However, says that Reeves' specimens are with the localities. This species is very closely related to the next though they are nevertheless specifically quite distinct.

22. *ONNOSIA VENOSA* Baker in *Hook fil Fior. Brit. Ind.* ii. 254 (1857); *Pram, Jouru. As. Soc. Be<ng.* lxi. 2. 152 (1897).

MALAY PENINSULA; Malacca, Maingay!

A very distinct species, the one to which it is most closely related being the one which comes from a very remote locality.

As regards distribution the most striking features connected with *Onnosia* are (1) the wide-spread occurrence of this genus throughout Eastern Asia, from Hupeli in China to Bangka in the Malay Archipelago and from Travancore and Nepal to the Philippines: (2) the remarkably limited range of individual species with the exception of *Purvifolia* (*O. bancana*) which extends from the Malay Peninsula to Bangka and Borneo, and to a less extent of *O. sumatrava* which occurs on both sides of the Straits of Malacca. *O. robusta* also has a wider range than most, extending from the valley of Assam through Silhet and Chittagong to Pegu and Tenasserim. It is interesting to note that very closely related species such as *Wchyaama*, *O. venosa*, and *O. yunnanensis* and *O. sumatrana*, may be considered as widely separated localities. In the first instance one of the species is a native of Hong-Kong, the other is a native of Malacca. The specific names of the other pair indicate their respective habitats.

From the following tabular statement it will be seen that of the 22 species enumerated one is S. Indian; one Himalayan; two, but one of these with two quite distinct varieties, occur in the Kachin Hills; five occur in China; one in Tonkin; one in the Philippines; one in Borneo, Penang; this species also occurs in Bangka and throughout the Malay and in three in Sumatra, though one of these also occurs in Malacca; and eight in the Malay Peninsula, though one of these extends to Bangka and Borneo and another extends to Sumatra. The remaining species, *T. illecebra*, forms a very distinct subgenus, is widely spread from Assam to Tenasserim in a region where no other species occurs—a region moreover which separates the two chief centres of the genus in South Eastern Asia, viz. —the Kachin-S. China area, and the Malay Peninsula. It is worthy of remark that, so far, no species has been recorded either in Java or from Ceylon.

Table of distribution of the South-Eastern-Asiatic species of *Ormosia*.

S E C C A X													
S E C C A X	S. India.	1	1	0	10	1	1	1	3	8	1	1	1
	G. and E. Himalaya.	1	1	0	10	1	1	1	3	8	1	1	1
	Eachin Hills.	1	1	0	10	1	1	1	3	8	1	1	1
	S. China.	1	1	0	10	1	1	1	3	8	1	1	1
	Tonkin.	1	1	0	10	1	1	1	3	8	1	1	1
	\8sam and Ghittagong 1	1	1	0	10	1	1	1	3	8	1	1	1
	Pegu and Tenasserim.	1	1	0	10	1	1	1	3	8	1	1	1
	Samatra.	1	1	0	10	1	1	1	3	8	1	1	1
	Malay Peninsula	1	1	0	10	1	1	1	3	8	1	1	1
	Bangka.	1	1	0	10	1	1	1	3	8	1	1	1
	Borneo	1	1	0	10	1	1	1	3	8	1	1	1
	Philippines	1	1	0	10	1	1	1	3	8	1	1	1

REPORT ON THE INDIAN SPECIES OF *PTEROCARPUS*.

Three years ago I had occasion to allude to certain points connected with the genus *Pterocarpus* which have been left or been made obscure in Indian botanical works. The genus is, from the Forest Officer's point of view, an exceedingly important one; it includes the trees that yield Gum Kino, Red Sanders, Andaman Red-wood and, usually, Padouk. The chief obscurity rested on the last, and has been so great that more than a year ago the Inspector-General of Forests asked for assistance in collecting information regarding that timber. What had to be ascertained was (1) "whether the fact that Padouk wood is sometimes of a rich red colour and sometimes brown is simply due to the conditions under which the trees grow, or whether the different coloured woods represent different varieties of the tree; and (2) whether the Burma Padouk, which is 20 per cent, heavier than that of the Andamans, is botanically identical with Andaman Padouk."

The second question is the simpler to answer. Its origin is due to the fact that it has become usual to identify the tree which yields the Andaman Red-wood—now known as Andaman Padouk, described by Roxburgh as *Pterocarpus dalbergioides*—with a tree from the Malay Archipelago to which Willdenow gave the name *Pterocarpus indicus*. It has, moreover, been usual to believe that *Pterocarpus indicus*, which does occur—though probably not as an indigenous species—in Tenasserim, is the source or at all events a source of Burma or True Padouk. It was right, as he usually was when dealing with so important an economic question as this, in considering the Andaman Red-wood tree to be distinct from *P. indicus*. This has already, as I believe, been satisfactorily shown. Further, the Andaman Red-wood is obtained from a tree distinct from that which yields Burma Padouk. It is to be recollected that, though acquainted with both *P. dalbergioides* the Andaman Red-wood tree, and *P. indicus*, Roxburgh makes no reference to the timber known as Padouk or to the tree that yields it. The *A priori* inference therefore is that the timber Padouk is the product neither of *P. dalbergioides* nor of *P. indicus*, but of some third species. As we proceed we shall find this inference amply confirmed.

* Beddome, *Flora Sylvatica*, t. 23, whose figure is really a copy of Wight's (t. 8, Roxburgh's) drawing of *Pterocarpus dalbergioides*; Kraudis, *Journal of the Asiatic Society of Bengal*, p. 114 and 454.

in *Diet. Econ. Prod.*, vi, 1, p. 355.

t *Journal of the Asiatic Society of Bengal*, lxvi, 2, pp. 124 and 454.

The first question has already been faced by Mason, however, answer it to his own complete satisfaction, or to ours, says Mason, two species of Padouk in Burma—white—the red producing the finer timber, the white being by more ornamental tree. In his Burmese *Forest Flora* Kurz two species of *Pterocarpus*. One of these is the stereotyped and is not therefore a real species, because Kurz includes bases the description chiefly upon, the quite distinct *V. indochinensis* other is *F. macrocarpa*, a species first differentiated by Kurz. Both of them he terms Padouk in the *Flora*; elsewhere, however, states that he is unable to say whether the two species adopted correspond to the two kinds of Padouk—Padouk-red and Padouk-white—which he, like Mason, found recognized by the

It having been arranged that botanical specimens of Padouk be sent to Calcutta from Burma and the Andamans, I took advantage of the opportunity afforded by a brief visit to Europe to examine specimens of *Pterocarpus* in the Herbaria of Kew, of the British Museum, and, particularly, of the Linnean Society of London. These last are essential to examine, because the Society's collection is the one which includes the original type of *Pterocarpus* W. & A. In connection with this particular plant there were two difficulties: (1) the discrepancy between Mason's description and his figure of the species; and (2) the fact that (here is in the Calcutta Herbaria) specimens, not quoted by Wight it is true, but, nevertheless, named by himself in Stocks' collection, which agrees neither with his description. On my pointing out that it has sometimes been said that *P. indicus* is a native of India as well as of Burma, the Inspector-General of Forests was so good as to request all Indian Forest office's various Calcutta specimens of any *Pterocarpus* to be found in their various collections. So far as negative evidence is of value, it may be said that *P. indicus* does not occur in India, for no Indian Forest officer has sent a specimen of that tree. The specimens sent have, however, an interest inasmuch as they prove that the Gum Kino tree is present in several places where it was not certainly known to occur. The officers in charge of the forests of Scinde, of the Punjab, and of Assam are the only ones who

• Mason, *Burma*, pp. 405, 484, 531.

† *Journal of the Asiatic Society of Bengal*, xlv, 2, 27S. 4 s will be seen on, the officers of the Forest Department now find that Padouk—white—Padouk, not "white" Padouk.

J Mason, *Banna*, 484.

§ Bentham, *Journal of the Linnean Society*, iv, Suppl. 77; Baker in *Flora of British India*, ii, 239: Bed dome, however, *Flora Sylvatica*, t. 23, he never has found it wild in Southern India.

written^{en} *^o say that no species of *Pterocarpus* has been found growing
with^{lill} ^eir respective areas. As regards Scinde and the Punjab this
De expected, although the tree exists so near to both areas as
Mount Abu; as regards Assam the statement is interesting, because
the tree is recorded both by Voigt* and by Mason† as having been
found in that province. There are no specimens from Assam at Calcutta
now » out the existence of the statement in Voigt's work implies its
accuracy by Carey and Griffith, and indicates the necessity for caution
in designating Assam as a locality. So far as the evidence afforded by the
specimens submitted goes, it would appear that no form of "Padouk"
is derived from *Pterocarpus indicus*. The officers of the department in
Bengal have sent many specimens of red, brown, yellow and white
Padouk, but it is one of the interesting features of this enquiry that,
so far » not one of the specimens sent is a specimen of *Pterocarpus*
in *tens*. This alone goes far towards justifying the inference to be
drawn from Roxburgh's silence.

Though the present note on the genus adds little to our botanical
information regarding the four Indian species of which specimens have
been sent, it tries to exhibit what information we do possess in a com-
pact and accessible form. It gives a more accurate account of the
distribution both of the Gum Kino tree and of the Burma Padouk than
was hitherto possible; describes the forms assumed by the Gum Kino
tree in different parts of India; settles definitely the source of true
Padouk, and sets at rest the relationship of the original or Burma
Padouk to the Andaman Red-wood, now more familiarly known as
Andaman Padouk.

A few minor points, which are specifically alluded to in their proper
connection, have still to be settled. The statement of these may induce
Forest officers, who are in the best position to afford the necessary aid,
to collect and transmit the requisite material to the Calcutta Herbarium.

PIEROCARPUS LINN.

Erect trees with alternate compound leaves; leaflets alternate, exstipulate; flowers yellow, in copious, usually paniced racemes; bracts and bracteoles minute, caducous; pedicels distinctly articulate at the apex; calyx turbinate, curved before expanding, the teeth short; petals exerted with long claws, standard and wings with crisped edges; keel obtuse, the petals scarcely cohering or quite free; staminal sheath slit both below and above or above only, in either case with the vexillary stamen united or free, the anthers versatile; ovary stalked, 2-ovuled; style incurved,

* Voigt, *Hortus Suburbanus Calcuttennis*, p. 242.

† Mason, *Burma*, 485.

stigma terminal; pod orbicular, rarely more than 1-seeded, with a rigid wing with its point tamed to near the base*

Key to the Species.

Leaves thinly coriaceous, quite glabrous beneath when adult; pods, even when young, only very sparsely pubescent; racemes panicle-like:—

Leaves ovate-lanceolate narrowed gradually to a point, not wholly of nerves distinctly raised beneath; panicles 2-3 leaves; terminal, only extending into the fruit; style usually bracteoles ovate; edge of pod between stipe and concave *J. ergoides*.

Leaves ovate-rounded with a sudden blunt point, beneath hardly more prominent than secondary veins; panicle axillary, only one being terminal; bracteoles lanceolate; edge of pod between stipe and style convex *J. indicus*.

Leaves firmly coriaceous, finely pubescent beneath; pods when young velvety:—

Flowers axillary, in simple or sparingly branched racemes. pedicels

Leaflets 6-9, ovate, bluntly acuminate, mucronulate; considerably longer than calyx ... *M. arbus.*

Leaflets 3 (rarely 4-5), roundish, retuse or obtuse; pedicels not exceeding calyx ... *M. santalinus*.

Flowers in terminal panicles, pedicels shorter than calyx; leaflets 5-7, reflex, obtuse, acute or acuminate ... *Marrubium*.

1. **PTEROCARPUS DALBERGIOIDES** Roxb.—A tree 60-80 feet high with ascending branches, Leaves 8-10 inches, leaflets 5-9, moderate 2-4 inches long, 1-15 inch wide, the end one rather the largest, lanceolate, narrowed gradually to the apex with tapering rarely rounded base, 5-7 pairs of main nerves very distinctly raised beneath. Panicle large, much branched, terminal and extending only into one or two the uppermost leaf-axils, rachis and pedicels finely pubescent 1-2 in. long with two shortly ovate, caducous bracteoles at the apex. Pod orbicular, with stipe 6 in. long, the style only a short distance above the base and the periphery of the pod from stipe to style concave, rarely nearly straight, very rarely convex. Roxb. *Hort.* 53; DO. *Prodr.*, ii, 418; Wall. *Cat.*, 5843, *Utters* A, B, 0, E & A. *Proilr.*, i, 267; Roxb. *Flor. Ind.*, iii, 236; Wight *l.c.*, t. 246; *Port Suburb. Calcutt*, 242; Prain in *Journ. As. Soc. Veng.*, I, 124 and 454. *P. imucus* Wall. *Oat*, '5845; Dentli. in *Journ. Linn. Soc.*

iv, *Suppl* 77 (in part), *Bedd. Fl. Siamensis* t. 23; *Knurz in Journ. As. Soc. Beng.*, *Vol* 2, 278 (in part) and *For. Flor. Brit. Burm* i, 349 (in part); *Murray in Journ. Bot. Soc. Lond.*, vi, 1, 355 (in part); *Kort. & Valet. Bijdr.*, 2, 278 (in part); *Prain in Journ. As. Soc. Belg.*, Jx, 2, 311; *not of Willd.*

ANDAMAN ISLANDS; common. Sparingly cultivated, mostly in gardens > *n Bengal and Southern India.

This species is endemic in the Andaman group. As the citations show ^ has frequently been confused with *P. indiens*, but usually only by botanists who have had no opportunity of studying the two trees by side in the living state. Even in the Herbarium it is difficult to see how they could have been united.

The tree is common in South Andaman; it must, however, occur also in the North Island, because the tree was first introduced into the Calcutta garden in 1794, when the head-quarters of the Settlement were at Port Cornwall in North Andaman, the original Port Cornwall is now Poit Blair) in South Andaman having been abandoned in 1792: it is very scarce in Great Coco, just north of North Andaman. No other species of *Pterocarpus* occurs in the group; nor has this or any other been recorded, so far, from the Nicobars.

Burmese convicts at Port Blair now usually term this a Padouk; not uniformly so however, for a set of specimens obtained by Husein Ali, one of the Forest Bangers at Port Blair, is marked Pyinma (*Burmese*)—a curious mistake for a Burman to have made, the name Pyinma being usually employed as practically equivalent to the natural genus *Lagerbottmia*. All the specimens recently collected by Mr. Heinig personally me marked Padouk. But those obtained by Mr. Kurz in 1863 do not bear this name. They are marked Than-tya, *Burm*; *Djalániradá, Andam*. The specimens collected under the supervision of Mr. Man have no native name attached.

Mr. Bibbentrop has favoured me with the following interesting note explaining when and how the Andaman Bed-wood came to be called a Padouk:—

When I was Conservator of Forests in Burma I had a very profitable trade in the Tenasserim Red-wood, called Padouk, with the Madras Arsenal. I was at the time told in Moulmein, by Burmese timber traders, who evidently had their information from returned convicts, that as fine a Padouk as in Burma grew in the Andamans almost down to the water's edge; whereas our Burma Padouk, being heavy, cost a good deal to bring down.

"I tried to supply the Madras Arsenal with the Andaman species, but the wood did not find the same favour and even now their orders for Burma Padouk.

"When I became Inspector-General of Forests in 1885, I began to place the Andaman wood on the Calcutta and Home,

markets and called it Padouk, and I exhibited it as such in the London Exhibition of 1886. After this it began to get hold of the market, which, if of the right colour, it now commands the prices of first Mahogany."

The use of the term "Padouk" for the Andaman Bed-wood has depended (1) on the belief that *Pterocarpus dulbergioides* is flume as *Pterocarpus indicia*, and (2) on the further assumption that wood of *Pterocarpus indicia* is Padouk wood. The first belief is mistaken, and in discussing *P. indicia* it will be shown that the latter assumption is without foundation. But, though the application of the name Padouk to the Andaman Red-wood has thus been wholly accidental, there is nothing far-fetched in the use of the term. It will nevertheless continue henceforth to be known as Andaman Padouk; the timber, instead of being termed simply Padouk, will in future be known as Burma Padouk. The only point that has to be emphasised is neither Burma Padouk nor Andaman Padouk is obtained from *Pterocarpus indicus*.

The Deputy Conservator of Forests, Port Blair, deals with the question of differently coloured woods yielded by *P. dalbergioides* as follows.

"Statistics collected in 1896-97 and 1898-99 with reference to good coloured Padouk gave the following results :—

"Number of trees examined in 1896-97	...	...	635
Ditto ditto 1898-99	...	...	925
		TOTAL	1,400

"Number of good-coloured Padouk found in 1897-97	...	...	217
Ditto ditto ... 1898-99	...	...	695
		TOTAL	808

"The proportion of good-coloured Padouk to the total number of trees examined is accordingly 55.34 per cent.

"Specimens of Padouk leaves and flowers with numbered and specimens, bearing corresponding numbers, of the wood of the trees from which the above were gathered have been sent to the Superintendent of the Royal Botanic Garden, Sibpur, for identification and on receipt of information from him a fuller reply will be given in the concluding portion of your letter. In the meanwhile, however, I am able to state that Padouk wood of every kind of colour, from light gray to deep reddish brown and bright red, was obtained from trees growing under apparently identical conditions, and I observed the same variations in regard to colour of wood of the

case in fl. of T. Sal (Shorea robusta) when undertaking fellings" for sleepers in the Buxa Duars forests in 1887."

The infirmity of Mr. Heim's conclusions, as stated in the foregoing references, is amply corroborated by the specimens to which he refers. Every one of which represents *Pterocarpus dalbergioides*. Among over 100 specimens, representing 20 different trees, the difference in colour of timber is unaccompanied by the slightest tendency to variation in botanical characters.

PTEROCARPUS INDICUS Willd.—A tree 30-50 feet high with 2-3 inch long branches. Leaves 8-10 inches, leaflets 5-9, moderately firm, ovate with rounded rarely tapering base and rounded abruptly obtusely acuminate apex, the main nerves hardly more prominent than the secondary beneath. Panicles lax, little branched, all except the endmost one in the axils of leaves, racemes and pedicels glabrescent; pedicels 3-4 inch long, the end one rather the largest, Pod orbicular with stipe 3 inch long, the style some distance above the base and the periphery of the pod from stipe to style convex.

W. Sp. pi. iii. 9QJ. Roxb. Hort. Lieng § 53. DO. Prodr., ii, 419; Roxb. Flor. Ind., iii, 238; Voigt Hort Suburb. Calcitt, 242; Uenlh. J. Hort. Li. Soc. W, Suppl. 77 (in part); Miq. Flor. Ind. Bat, i, 135; Mason Burma, 405 (in part), 769; Kurz Journ. As. Soc. Beng., xlv, 2, 238 (in part); both synonyms); Bak. in Hook. f. Flor. Brit Ind., ii, 349 (in part); Murray in J. Kurz For. Flor. Brit Burma, i, 349 (in part); Forbes & Hemsl. Journ. J. Soc., xxiii, 199; Koord. & Valet. Bijdr., 2, 83 (in part); Prain fl. Soc. Beng., lxvi, 2, 123 and 454. P. Draco Lamk. Ill, t. 602, j. 6 (not a); not of Linn. P. dalbergioides Wall. Cat, 5843, letters H and K; Mason, Burma, 485, 531; iwt of Roxb. P. Zollingeri

Wallichii W. & A. Prodr., i, 267; Wight Jll., t. 70. P. saxatilis Bl. MSS. Hb. Bogor. "Lingoum saxatile Rumph. Sei-5. Amboin., ii, t. 70.

BURMA: Pegu, fide Kurz and Brandt's, but? Tenasserim; Moulmein, Falconer! Brandis! Amherst, Falconer! Tavoy, J. Collectors! MALAYA: Penang; Wallich! Malacca; Griffith! Maingay! Perak, Sartrechini! Kunstler! Wray! Sumatra; Tet/sntann! Java; Horsfield! Koorblers Sr Vnleton! Celebes; Koorders! PHILIPPINES: Fitfa. CHINA: M. Beechy, Hb. Roxburgh in Brit Museum! Spaiingly cultivated ab. Calcutta and Madras.

Since a careful search by every Forest officer in Burma for every kind of Padouk has been going on now for over year-and-a-half, and since during this search no Forest officer met with a single example of *P. indicus*, it seems certain that the name Padouk is not applied to *P. indicus* and possible that it is not an indigenous species anywhere in Burma. These

considerations call for a close enquiry into the circumstances that have led to the contrary beliefs (1) that *P. indicus* is a Burmese species, and (2) that it yields a timber known as Padouk.

The belief that *P. indicus* occurs in Pegu as a wild tree is based on the statements of Kurz, who says (*Journ. As. Soc. Beng.*, xlv, 2, 278) that it is 'rare' and again (*Forest Flora of British Burma*, i, 349) that it is 'very rare' on the eastern slopes of the Pegu Yomah. In connection with these statements it becomes therefore necessary to examine critically the specimens used by Kurz in preparing his Burmese Flora, of which all are in the Calcutta Herbarium. They consist of the following:-

- (0) Kurz's own No. J771, which he names *P. indicus* and which is therefore the basis for his Pegu Yomah locality.
 - (£) A specimen from Moulmein, collected by Falconer and named by him "*Pterocarpus Wainichii* W. p. A. a* *P. floribundus* Wall Cat. Padouk ?" This has been named *P. indicus* by Kurz and is *P. indicus*. It cannot be the basis for the Pegu Yomah locality.
- (3) Two specimens from Amherst, collected by Falconer, correctly named by Kurz *P. indicus*; these equally cannot be the basis for his statement.
- (4) A specimen on which is written in Kurz's handwriting the note, "1188 D. B.: Pegu D. B." This Kurz did not name; it is *P. indicus*, but there is nothing to indicate that it is from the Pegu Yomah.
- (5) A sheet with two labels, one bearing only the word "*Padouk*" in both native and English script, the other with the words "*Pterocarpus, Padouk, Pegu, Brandis*," not however in Brandis' handwriting. Kurz has named this sheet *P. macrocarpus* and there are, as a fact, four detached fruits of *P. indicus* on the sheet. The specimen itself is, however, *P. macrocarpus*. There is nothing to show that either of the plants represented is from the Pegu Yomah.
- (6) A sheet collected by Brandis, bearing the following note in Brandis' handwriting:—" *Pterocarpus dalbergioides*. Pegu Ten. Mart, pro*, most frequent east of the Sit?" This sheet has been named by Kurz "*P. macrocarpus* Kurz ?" It contains two species of *Pterocarpus*, the leaves being those of *P. macrocarpus*, the flowers, however, are those of *P. indicus*. There is nothing here to show definitely that either species was gathered on the Pegu Yomah. The fact that Kurz thought the whole sheet possibly *P. macrocarpus* indicates that he did not use these specimens as the basis for either of his statements if he used the specimens referred to under (5) as the ground for his statements, he did not have sufficient reason for so doing.

of to ^Er ^more ^Sen ⁽er ^{*}s ^tue ^e basis for the statement in the *Forest Flora* from ^Jntish ^Burma that *P. indicus* is frequent in the upper mixed forests the ^Andamans, every specimen named *P. indicus* by Kurz is a specimen ^o* *P. dalbergioides*. As regards Martaban, there is only one specimen ^m named *P. indicus* by Kurz. The locality he gives is "Martaban, ^Burmes name Padouk"; the specimen is, however, part of Kurz¹ ^{N.} 1772 and is not *P. indicus* at all, but *P. macrocarpus*. The two other ^Portions of Kurz¹ ^{N.} 1772, which are ticketed as from "Toungkyeghat, ^Pagodas" and "Toungkyeghat, Nakawa Ch&," respectively, are also ^o* *Macrocarpus* and have been so named by Kurz himself.

Every one of the Tenasserim specimens of *P. indicus* comes from ^Moulmeiu, Amherst or Tavoy. The fact that they come only from the ^{co}ast and from the neighbourhood of important towns, coupled with the ^{fact} that not a single specimen of *P. indicus* has been sent during the course of the present enquiry by any Forest officer in Burma, seems to ⁱndicate that even in these places *P. indicus* may be, as it certainly is at ^vangoon, only an introduced tree, the seeds of which came originally ^from ^xoni Malaya. One cannot, however, lay too great stress on the absence of ^o specimens sent by the Forest Department, because the only Pegu ^ones received from the department are two scraps of *P. macrocarpus* ^from Prome, though we know from other sources that the species is ^fairly plentiful in Toungoo as well as in Prome.

I have already alluded to Mason's belief that this tree, which he ^apposed to be either *P. dalbergioides* (Burma, pp. 485, 531) or *P. indicus* (Surma, p. 769), ⁱs the source of white Padouk—the tree which he ^{bel}ieved to be *P. Wallichii*, but which Kurz afterwards characterised as ^o* *macrocarpus*, being the source of Red Padouk. Kurz, however, was ^unable to say whether this was really the case; his caution has been ^{ju}stified by events, for the specimens of white Padouk sent by the ^oldest Department from Burma do not belong to *P. indicus*.

In their careful account of *P. indicus*, Koorders and Valeton have accepted the view of Kurz and of the officers of the Forest Department ⁱn India, that this species includes *P. dalbergioides*. They do so, however, only tentatively, for they say it is probable that two trees are deluded in their specific description. Moreover, in describing the wood ^of " *P. indicus* " they rely almost entirely on the information contained ⁱn the article by Thurston in the *Indian Forester* for 1892 (*N.* 7, append. ^oies 3-5), which, under the name Padouk, deals practically exclusively ^ath the Andaman Red-wood and not with Burma Padouk. Koorders ^and Valeton tell us, moreover, that Von Dentsch finds the specific gravity of the Java timber, that is to say, the timber of genuine ^o*-*indicus*, is only 0.54; this is about as much lighter than Andaman ^oed-wood as Andaman Red-wood is lighter than Burma Padouk.

BURMA; common. The following detailed list of localities for the specimens in the Calcutta Herbarium will indicate how widely the species is distributed. For the convenience of officers of the Forest Department these are given as far as possible according to the Circles.

Tenasserim Circle: S. Tenasserim Division; Tavoy-Mergui range (without precise locality), *F. Dept.* Palaw township, Tavoy, *F. Dept.* Mherst; Attaran, Mittikit Forest, *F. Dept.* B. Salween; Thaueryin Forest, *F. Dept.* W. Salween? (exact locality not given; sheet marked "Martaban"), *F. Dept.*

Pegu Circle: Martaban-Tenasserim prov., most frequent east of the Sintang, *Brandts!* Toungoo; (exact locality not given) *Eyre!* Tonkye-
& at, at 7 Pagodas and Nakawa Choung, *Kurz!* Prome; (no exact locality) *Wallich;* *F. Dept.* Karen Hills; (no exact locality), *Brandts!* Shan Hills: Royal Domain, Yeagnan, J & V *Collector!* (this is really on the borders of the Shan region). Upper Burma; Pyinmana, **aung* glang, *F. Dept!* Taw, Tobadowa, *King's Collector!* Minbu; *^gdwingi,* *F. Dept!* Mndalny; Kyokse, Kyoukmyoung, etc., *^V « Collector!* *F. Dept!* Lower Chindwin; Mongwa, *F. Dept!* Pkokko, Gungaw, *F. Dept!* Upper Chindwin, *F. Dept!* Mu Division, **Lept!* Chin Hills; Bau Myo, *King's Collector!*

Mason (*Burma*, p. 484) states that a kind of Gum Kino has been brought to Moulmein from the Shan States which has been said to be the Produce of the Padouk. This is not unlikely, but it has to be pointed out that the only specimens known to me which may be said to be of Shan origin are from the north-west border of the Shan country. Similarly the Hill specimens are from a locality very near the Irrawaddy valley.

This is the only Burmese tree sent simply as Padouk. Under the names Pyin Padouk and padouk-po, or male Padouk, two other trees have been sent, but neither of them is a *Pterocarpus*. The remarks made in the forwarding letters are sometimes interesting. Thus of the specimens sent from the Palaw Township, Tavoy, the Extra-Assistant Conservator writes that the Burmese name for the tree is Na-tha-ni and that its timber is used as a substitute for Red Sanders wood.* This officer adds, "there are) I believe, some three or four kinds of Padouk in this division. I have some logs of black Padouk in stock." No specimens of these other kinds, which it would be important for his department to know, have been sent. It would be particularly interesting to ascertain what "black Padoak" is. On the other hand, the Conservator, Attaran Division, in sending botanical specimens of Padouk from the Mittikit Forest, has identified them correctly as *notrocarpu*, and remarks that this is the only species of *Pterocarpus* that has been found. The specimens from the Tavoy-Mergui

* It should be remembered that *nasa-ni*, according to the *Dkt. of Economic Products*, is one of the Burmese names for the Red Sanders wood itself.

range are sent as Padouk-nye or Red Padouk; those from the Thauingyin Forest, E. Salween, simply as Padouk. The specimens from the Proine Division are two in number; both are *P. macrocarpus*, one is termed the Padouk, the other white Padouk. The leaflets are rather larger in the specimen termed white Padouk; otherwise the two do not differ, the specimens from Pyinmana are botanically identical, yet one is sent as Padouk, the other as yellow Padouk. With reference to these the Colonel Bingham has remarked in a letter to the Inspector-General of Forests:—"Lately I met a man who said it was possible to pick on a tree with yellow wood from the others. The Burmese declare it is possible to do so, and I think they are right." Colonel Bingham's experience with *P. macrocarpus* or Burma Padouk, is thus the same as Mr. Jenkins with *P. dalbergioides* or Andaman Padouk. So far as botanical goes, it is impossible to distinguish a Burma Padouk with red wood from Burma Padouk with yellow wood, and I agree unreservedly with Colonel Bingham and the Burmese. The Tanngdwingi specimens were sent by Mr. Jenkins simply as Padouk and identified by him with *P. macrocarpus*. They are, however, all *P. macrocarpus*. The specimens from near Mandalay were sent simply as Padouk; those from the Upper Chindwin and Pakokko, collected by Messrs. Kavanagh and Jenkins, respectively, as *Pterocarpus* sp., with no vernacular name. A very interesting set of specimens, if only they had been botanically more complete, came from the Lower Chindwin. They were named respectively:—Padouk-nye, Red Padouk; Padouk-sat, or Padouk of mixed colour, brown and yellow; Padouk-nyo, or Brown Padouk and Padouk-po, or male Padouk. Except the last named, all of them are *Pterocarpus macrocarpus*. The tree, however, is not a *Pterocarpus* at all, but is the tree named, in the *Flora of British India*, *Dalbergia ovata* Grah. VAR. *obtusifolia* Baker, and in the *Forest Flora of British Burma*, *Dalbergia glauca* Wall. The arrangement adopted in the *Forest Flora* is, in one way, the better, for *Dalbergia ovata*, which is the tree known to Burmans as Thithsonk-yo, or chisel-wood, its timber being good for that purpose,* is quite distinct from the male Padouk. But *Dalbergia glauca* Wall., is really, as Baker says, the same thing as *D. ovata* Grah., and the male Padouk, or *D. glauca* (not of Wall.), will have to be known as *Dalbergia obtusifolia*.

Specimens of another tree, which proved to be no *Pterocarpus*, were sent as Pyin Padouk from the Tenasserim river. This tree is a *Dalbergia*, as has elsewhere been explained.

The leaflets of Padouk are rather narrower for their length in Tenasserim than in Upper Burma, but the Proine and Toungmye specimens are exactly intermediate between the extreme forms.

* Parish, in a MSS. note in Herb. Calcutta.

t A new Burmese Timber-Tree ; Indian Forester for July 1900, p. 312.

shape as in 1. ^{occ} are obtuse ^h sometimes the leaflets in Upper Burma specimens of the ^h mucro, due to a prolongation of the leaf is equally marked. As regards flowers ^{is no difference} anywhere.

From ^{what} has been said above it will be seen that *P. macrocarpus*, and ^{alone}, is entitled to the name Burma Padouk and that, ^{in the} case of *P. dalbergioides*, the differences in colour of wood do not ^{but} botanical varieties of the tree. The Deputy Commissioner ^{of} Ponnampet, Pynnmana, who apparently thinks otherwise, has sent, as yellow and red Padouk respectively, specimens of leaves, flowers and fruits that are botanically indistinguishable. The woods are certainly very different in colour, but, to use this officer's own expression, ^{there is no difference in the value or quality of the wood,} both ^{Used chiefly for naves of wheels and spokes and felloes."} *P. macrocarpus* SANTALINUS Linn. f. ~ A small tree. Leaves 4-7 inches ; leaflets 3 (very rarely 4-5) firmly coriaceous, rather closely persistently ^{addressed grey silk on the lower side 1.5-3.5 inches long, 1.25-3 inches} width ^{considerably the largest, roundish or wide-oval, reticulate, 8 or 10 pairs of nerves slightly prominent, much more distinct than the secondary venation.} ^{Richer more distinct than the secondary venation.} ^{sparingly branched, axillary except the solitary terminal pedicels addressed grey silky; pedicels 15 inch long, 2 caudex, 2 racteoles at the apex. Pod orbicular, with stipe of pod between stipe and style straight or only slightly convex. Linn. f. W. Plant., 919; Spreng. Syst., 192; Roxb. Hort. Beng., 53; Wall. Cat., 68U; Wi & A. Prodr., i, 266; V. Hort., 242; Roxb. Flor. Ind., iii, 234; Bedd. Sylvat., t. 22; Bak. in H. O. A. J. Flor. Brit. Ind., ii, 239; Murra y in J. P. Prod. if 359.}

^{INDU} ^U ^{ffcllat} ^{Jtoewffr} ^{Hflj/ne/} N. Arcot; Namandar, F. Deph. ! ^{Maapah, Brandis! Gamble! Wight! F. D&pt. i} Nellore, F. Dept. ! ^{is} cultivated, Willis!

^{is} nothing to add to the received descriptions of the Lai ^{&dan or Red Sanders tree.} The solitary point of dubiety left by ^{8"t and Arnott in their description is still unsettled.} During many ^{seen specimens with loaves like those of P. santalinus} with more than three leaflets. This year, however, Mr. ^{ke8} has sent from Nellore, under the native name "Tegi," specimens which he identifies with *P. Marsupium*. The leaflets ^{s specimens, but for the fact that they are four or five in number} of three, are very like those of *P. santalinus* and very different ^{those of any specimen of P. Marsupium that I have seen.} Till ^{ers and froits of Mr. Foulkes' tree are received, the point whether}

P. santalinus ever has more than three leaflets must continue unsettled. Lit has now been settled; see final paragraph, p. 16].

5. PTEROCARPUS MARSUPIUM Roxb.-A medium to tall tree. Leaves 7-9 inches; leaflets 5-7, firmly coriaceous, sparsely persistently adpressed hairy beneath, elliptic and obtuse or deeply 2-lobed, 3-5 inches long, 2-3 inches wide, or ovate to lanceolate acute or acuminate 1.5-2.5 inches long, .75-2 inches wide, the end leaflet the largest, 15-20 pairs of nerves very slightly prominent beneath, but usually more distinct than the secondary venation. Panicles terminal, large, much branched, rachis and pedicels rusty puberulous; pedicels .1 inch long with two small ovate caducous bracteoles at the apex. Pod orbicular with stipe .2 inch long, the style some distance above the base; periphery of pod between stipe and style convex.

CEYLON; central parts of the island. INDIA; general from Courtallam to Abu on the west and to the Rajmahal hills on the east; also in the Sub-Himalayan forests from Gorakhpur westward to Pilibhit in Kumaun. Not as yet recorded from the Sikkim Terai or the Duars; stated by Mason and by Voigt to occur in Assam, but the statement not confirmed. The Gum Kino.

There are two rather marked varieties, each of which shows two somewhat distinct geographical forms. These are :-

VAR. a; leaves elliptic 2-lobed, slightly notched, obtuse or sub-acute, 3 inches long or longer, fruits rarely over 2 inches across.

Form 1, *biloba*; leaflets deeply notched at the apex, elliptic or somewhat obcordate. *P. bilobus* Roxb. MSS. ex G. Don *Gen. Syst.* 2, 2W-CEYLON; C. Province, *Thwaites!* S. INDIA; Coimbatore, >. *Bept.* /

This is the only form reported from the districts mentioned; it cannot, however, be considered a separate variety, because intermediates between it and the true *P. Marsupium* are plentiful among the specimens from Arcot, Cuddapah and Bellary, and occasional among those from the Kistna district. No specimens with 2-lobed leaflets occur among specimens from north of the Kistna river.

Form 2, wraj leaves elliptic or oblong, slightly notched or obtuse, rarely subacute. *P. Marsupium* Roxb. *Coromand. PL* ii, 9, t. 116; #* *Beng.* 53; Willd. *Sp. Pl. Hi.* 905; Spreng. *Syst.* iii, 192; Roib. *Flor.* * * * ni, 234; Wall. *Cat.*, 5842; W. & A. *Prodr.*, i, 266; Voigt *Sort.* * * * *Cahutta*, 242; Bedd. *Fbr. Sylvat.*, t. 21; Bak. in *Hook. f. Flor. Brit A.* * * * 49; Murray in *Watt, Diet. Econ. Prod.*, vi, 1,357; Prain *Journ. M-Soc. Bev.*, lxxvi, 2, 455.

S. INDIA: Nilgiris, Coonoor, *Gamble!* N. Arcot, *F. W.* Nellore, >. *Bept.* / Carnatic, *Heyne!* *Griffith!* Cuddapah, *tf 0J**

Bellary, F. Dept! Kurnool, F. Dept! Kiscna, F. Deyt! Mysore,
* Thomson!

Among these specimens occur many with here and there a leaflet
or a whole leaf approaching the form *biloba*.

E. INDIA: Vizagapatam, Golgunda, F. Dept! Godaveri Dist.,
Waghorn! F. JDept! Ganjam, F. Dept! Orissa; Khurda, F. Dept!
Sonthal Pergunnahs, F. Dept! Chota Nagpur; Palamau, Schlich!
Qinhle * Dept! CENT. PROVINCES; Mandla, F. Dept. !

The specimens here enumerated are very uniform and conform to
the tree as described and figured by Roxburgh, whose original specimens
there from the Circars. The Sonthal Pergunnah specimens and some of
from Ganjam show a tendency to pass into the next form. Those
from Palamau however, are exactly like the typical tree and so,
those from Mandla.

tip, 2-5 inch. leaves cuspidate-acuminate or acute and tapering to the
tip, 2-5 inch. leaves cuspidate-acuminate or acute and tapering to the
tip, 2-5 inch. leaves cuspidate-acuminate or acute and tapering to the
tip, 2-5 inch. leaves cuspidate-acuminate or acute and tapering to the

caudate P. leaves acute to P. & *o the tip, not or only slightly
Suppl. 77. VAR.— Benth. Journ. Linn. Soc., iv,
N. INDIA

Samaun, N. INDIA, Orakhpur, Ondh « F. * * * TMTM'', w. » £)
^ercara, Coo p INDIA 5 N Malabar > B ^ w' - « ^ O ». i w . ,

from Coonda specimens approach the next form; the specimens
from Coonda show intermediate stages between this form and the true
Marsupium of the Circars and the Nilgiris. The specimens to
which Benthham refers were collected by Madden in the " Warree Hills
in the Mungger in Central India."—The only Monghyr known to me
is in Behar, and the only Wari known to me is in Bombay, so that
the exact locality of Madden's specimens remains obscure. It is the
existence of this form that renders it impossible to claim full varietal
rank for the otherwise very distinct form which follows.

Form 4, *acuminata*; leaves cuspidate acuminate. P. *Marsupium*
VA «; *acuminata* Prain Journ. As. Soc. Beng., Ixvi, 2, 455. P., Mar-
9 * « i Grah. Oat Bomb., 56; Dalz. & Gibs. Bom. Fl., 76; Talbot
B. * * y List, 77. P. Vijaya Ham. MSS. P. Wallich U Wight MSS. *

H. W. Stynn Si not of w & A
BEHAR; Rajmahal Hills, Kurs! C. PROVINCES; Narsingpur,
F. Dept! Damoh, F. Dept! Balaghat, F. Dept! Jhansi, F. Dept!
Pachmarhi, F. Dept! HYDERABAD; Ellichpur, F. Dept! C. INDIA;
Khandw Stocks!

CONCAN J Gujah, Ritchie! S. Thana, F. Dept! Oanara, Talbot!

Two of the officers who have forwarded specimen B have remark-
ed on the appearance or uses of P. Jf W « , » . Mr. Shakes-
peare says of f o TM 3. "the tree is found only in the east of
the Pilibhit district, is very scarce and of no sue, though at
411.

is said that before the forests were conserved large stems used to be made with and felled for making native drums, in which there is still a fair trade from Nepal." *AB* the tree ascends to a considerable elevation in Kumaun, it possibly does the same in Nepal. Mr. Witt reports that in Damoh, form 4, which is the form he sends, does not grow to any great size, 3040 feet being a fair-sized tree: he adds that it flowers very irregularly.

The District Forest Officer of Trichinopoly has sent some interesting wood specimens. These include three pieces of Vengai (*Pterocarpus Marsupium*) and two pieces of Sembulichai, which is, he says, the Tamil name for a species of *Pterocarpus*. The wood is not that of a *Pterocarpus*; the name Simpuliccai (of which *Sembulichai* is probably a form) is given in the *Diet, of Econ. Products* as connoting *Eriythroxylon monogynum* the Bastard Sanders Tree. It will be of some interest, therefore, to be able to corroborate this; but the District Forest Officer did not send botanical specimens along with the woods, and has not yet been able to comply with a request for these, made on receipt of the wood specimen.

It should be noted that Wight and Arnott in a tentative way proposed to identify the *Karin-Tagera* of Rheede (*Hortus Malabaricus*, vi, 25) with *Pterocarpus Marsupium*. They say, however, that if identified, Rheede's figure is a bad one. Dillwyn (*Bef. to Eort. Malabar.*, 27) is doubtful about this identification and gives also the name of one of Dennstedt (*Schl. zum Eort. Malabar.*, 32), *Cassia candei* Deimst. Both Dennstedt's and Wight and Arnott's suggestions are far afield. There is little to find fault with in Rheede's figure, which is a good representation of *Dalbergia torta* Orab. (*D. monosperma* Dalz.).

The tree which was, by Loureiro, named *Pterocarpus flava* (Goerinchin., ii, 625) and which Kurz (*Journ. As. Soc. Beng.*, 278) has included in *P. indicus*, is based on the figure given by Phipps of Malapari [*Heib. Amboin.* iii, t. 117). Phipps' figure is not that of a *Pterocarpus* at all, but is a good representation of the common "Karanj," *Pongamia glabra*. The *Pterocarpus floribundus* Wallich's List, alluded to under *P. indicus*, is an Assamese variety, is not a *Pterocarpus* but a *Denis*.

An opportunity of examining some living trees of *Pterocarpus* has occurred while this report was passing through the press. Leaves with 4 leaflets do occasionally occur; so do leaves with 5 leaflets, the latter are exceedingly rare. Leaves that have more than 3 leaflets are always the ultimate leaves of their twig.

D. PRAIN.



•Qi I

A.L. Singh del.

Lith. by Chitra Saha C.

PEDICU
 A. VAR. *typica* CHANOLOPHA Maxim.
 B. VAR. *longicausta*

PLATE 2208.

PEDICULARIS CRANOLOPHA Maxim.

SCROPHULARINEÆ. Tribe EUPHRASIES.

P (§ .
(18^) et xii. 795, t. i
Calcutta
calibus
3-dentato
serratis
sigmo
fere
VAR.
truncat
HVB
VAIJ

UL 67 0(H)); humilis, pilosa, foliis lineari-oblongis radi-
segmentis lanceolatis serratis, calyce ovato
summo lanceolato lateralibus ovato-lanceolatis
calyce 4-plo longiore, galea cristata, rostro
labii lobo medio emarginato lateralibus
omnibus hirsutis.

TYPICA; S alffi crista ad rostri originem usque extensa ibique
P. cranolo P h a Maxim.
na; prov-Kansu, Przewalshi!

exceii8a ^'y 6100^1711 far- nov.); galea3 crista ad rostri originem usque
cornu rostrum subaequans producta.—P. birostris
in Journ. Bol v. (1801)107.

This plant of Mr. Pratt's collection, though it has to be ruicired to
found (1?scribed R^cies, is the most interesting *Fedicularis* he has
owing to the curious crest, one of the most interesting
interesting genus. *Pedicularia cranolopia* is not the
species with a crested galca; the condition occurs in *P. toria*
Franchet, *P. criatata* Maxim., *P. leptorhiza*
and *R. tegeliana* Prain. But in none of them does the
e, ^rblonged into a free process 4-5 mm. long,
the lengfch of the truc beak_ And yetf save for thi8 solitarj...
certainl y striking—character, there is nothing to separate
Pratt's Szechuen plant specifically from General Przcwalslus
one. Mr. Pratts specimens are more robust than those sent to
Jentu by M. Maximowicz, and thiej show distinctly, what M.
the
of the louer lip in this species is ciliate.

area of distribution of the species is, by Mr. Pratts gathering,
what extended. - D. Prain.

*V A1. Calyx (VAR. ^/C«). A2. Corolla-lip, hood, and portioD of tube (ditto).
2 **J*(VAK. longicornuta). Bi. Curoll<-lip, hood, and portion of tube (dufoj.
natural size.

PLATE 2209.

PEDICULARIS RHYNCHODONTA Bur. et Franch.

SCROPHULARINEAE. Tribe EurnisiE^.

P. (§§ *Rhynchosantas*: series nov. ante *Comosax humiles*,
hirsuta), foliis pinnatisectis, spica densa centrifuga, calyce
 dentibus summo excepto serratis) *RHYNCHODONTA Bur. et Franch.*
Journ. Bot. v. (1891) 108; nana, hirsuta, radice validaefibus
 fusiformibus fasciculata, canle digitali basi squamis
 suffulto; foliis petiolatis anguste lanceolatis plensque
 caulinis minoribus sparsis, omnibus pinnatisectis
 mentis subimbricatis ovato-lanceolatis serrato-dentatis,
 multiflora centrifuga, bracteis membranaceis laciniatis,
 calyce breve pedicellato campanulato, antice vix tisso,
 mento summo lanceolato integro lateralibus oblongis serratis
 anticisque lanceolatis serratis fflquilongo, corollae rubrae
 calyce vix dimidio longiore labio galea requilongo latissimo
 margine ciliolato, lobo medio rotundato lateralibus flabellatim
 vix dimidio minore, galea arcuata tubo subcontinua
 rostrum latum breve apice undulato-truncatum
 utrimque longe 1-dentatum abeunte, staminibus medio tubo
 mentis anticis triente summo hirsutis, posticis prope
 tantum parce barbatis, ovario ovato-lanceolato, disco antice
 stigmate exserto.

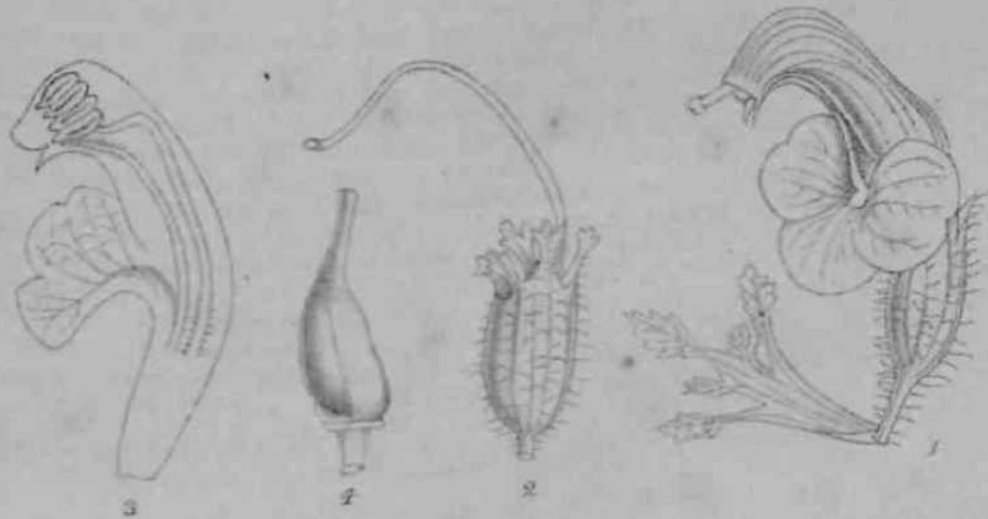
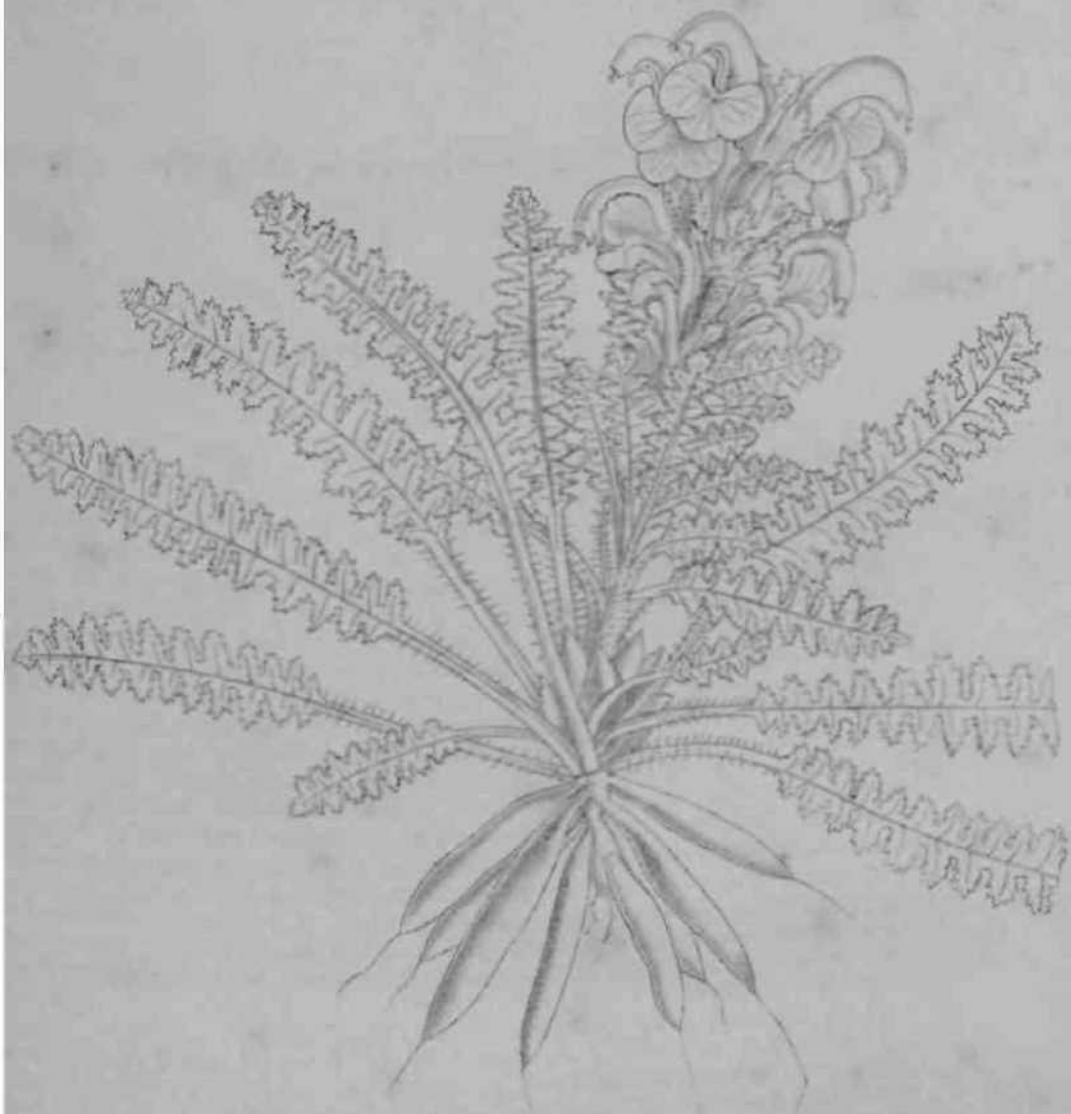
HAB. China j prov. Szechuen, Pratt (No. 735)!

Caules 6-8 cm. alti, radicibus 3-4 cm. longis his 0.5 cm. crassis.
Folia petiolis radicalibus 3 cm., laminis 4 cm. longis, 1.25-1.5 cm. latis,
 segmentis 4-7 mm. longis 3 mm. latis, pedicellis 0.5 mm. *Flores* calyce
 12 mm. longo, 5 mm. lato, corollae tubo 16 mm. longo, galea 12 mm.
 longa, rostro 2 mm. longo latoque, labio 12 mm. longo, 16 mm. lato

The corolla and bracts bring this very close to *P. apodochila* Maxim., and *P. rubens* Steph., but it differs so remarkably in
 foliage (in which respects it simulates the *Hinuta* and the *Hinuta* among *Anodontes*) from all the *Bidentatae* hitherto reported, that it is
 necessary to recognise it as the type of a new group (*Hynchosanta*)
 to be inserted between the *Elate* and the *Comosax*.

Besides differing so markedly in general appearance from
P. apodochila and *P. rubens*, this differs from *P. apodochila* in
 the calyx hardly cleft, the lip rather smaller (not longer than the
 galea), the corolla-beak rather longer and somewhat different in shape.
 The beak is almost exactly that of *P. rubens*, but it differs from
P. apodochila does) from that species in having a sessile (not stip
 lip, and in having serrate (not entire) calyx-teeth.—D. Prain.

Fig. 1. Flower, with bract. 2. Calyx, with style. 3. Tip of corolla, showing
 staminal insertion. 4. Ovary, with disc. 1, 2 and 3 are twice, 4 four times,
 natural size.



Singh. del.

PEDICULARIS RHYNCHODONTA Bur. & Franch.

Lith by Chars. Saha C.



A. L. Singh del.

Liti hj C; *intra. Silp*: 04

PEDICUHAHIS HEMSLETCANA Frsm.

sprinted from Hooker's *Icones Plantarum*, Vol. XXIII, t. 2210 (1894).

PLATE 2210.

PEDIGULAEIS HEMSLEYANA *Prain*.

SCROPHULARINEAE. Tribe EUPHORBIEAE.

⚔ (§ *RhynchoIophaB* §§ *FurfuTace©*) HEMSLEYANA *Prain* (*sp. nov.*); elata glabrata rhizomate brevissimo vel parum elongato repente, collo paucisquamato, squamis avatis membranaceis, radicibus fibrosis cespitosis, caulibus elongatis laxis adscendentibus parce foliatis, *folia* radicalibus mox evanidis caulinis sparsis longe petiolatis lamina supra glaberrima snbtus furfuracea oblongo-ovata pinnatipartita-sectave segmentis 5-8-jugis oblongis serrato-dentatis, *ffloribus* laxe racemosis, brove pediocclatis, bracteis foliaceis, *calycis* membranacei nee fissi 5-dentati segraentis lanceolatis summo acuto reliquis obtusis omnibus integris v. maforibus utrinque 1-2[^]serratis, *corollse* puniceaB tubo sursum ampliato calyce dimidio longiore, labio 3-Iobo lobis integris ovatiis supparibus medio prominente, galea angulo recto incurva inflata, parte basali erecta fauce 2-auriculata, parte antherifera horizontali in rostrum porrectum apice acxrtum integrura producta, *staminibv,8* ex adverso medii ovarii insertis, filamentis anticis hirsutis, ovario lanceolato, stigmatate incluso.

HAB. China; prov. Szechuen; *Pratt* (No. 684) f

Oaules 45 cm. alti, pennaB corvinaB crassitudine, radicibus 5-8 cm. longis. *Folia* pctiolis 1*5-3 cm. longis, lamina tf-8 cm. longa_f segment is Aiajoribus 2-4 cm. longis, 7-12 mm. Iatis. *Flores* pedicellis 3 mm., *calyce* 4'5 mm. longo, 2*25 mih. lato, *corollse* tubo 3 mm. longo, galea3 parte basali 3 mm. longa, parte horizontale 3*5 mm. longa, rostro 4 mm. longo, labio 7 mm. longo, 7'5 mm. lato (Iobo medio 4 mm. longo, 3'25 mm. lato).—D. Prain.

Fig. 1. Flower, with bract. 2. Calyx laid open, showing orarj and style. 3* Half of corolla seen from witkiu, showing stumiial iusertiou. All 2& times natural size.

PLATE 2211.

PHTHEIOSPEERMUM TENUISECTUM Bur. et Franch

SCROPHULARIACEAE Tribe EUPHRASIEAE.

P. tenuisectum Bur. et Franch. in *Journ. de Botanique*, V. (1891) 129;
perenne, rhizomate lignoso, multicaule, caulibus simplicibus vel parce
ramosis foliisque viscido-pubescentibus, foliis oppositis ambitu ovatis
acutis dissectis 2-3-pinnatisectis, floribus axillaribus solitariis ebrac-
teolata, pedicellis brevissimis, calyce campanulato 5-partito denti-
bus angustia sutura subulato integro ceteris lanceolata pauci-dentatis
paulo brevioribus, corollae tubo latiusculo superius ampliato faucibus
limbo margine ciliato 2-labiato, labio postico erecto breve 2-loba lobis
replicatis in alabastris interioribus, antico longissimo patente 5-seg-
mentis obovatis margine truncatis, praefloratione medio basi
2-gibbiter lobosque posticos statim amplectente et lateralibus parum
majoribus vicissim obtecto, staminibus sub galea inclusis filamentis
ex adverso summi ovarii insertis anticis prope basin parum hirsutis
ceteris posticisque prorsus glaberrimis, antheris margine nimirum
barbatis loculis aequalibus distinctis parallelis basi submucronatis
ovario ovoideo supra et praesertim antice piloso, stylo apice dilatato
stigmatibus 2-lobis, lobo antico parum longiore, ovulis in loculis numeri
rosis, capsula (immatura) compressa rostrata, seminibus (immaturis)
ovoideis testa reticulatis.

HAB, Himalaya orientali; Tassi-chen-doom, in valle Chitimi, *Herb.*
Hort. Calcutt. Tibet australi; Karoo-la, prope Lhassam, *Herb.* Hort.*
Calcutt. Szechuen occidentali, ad lines orientales Tibetiae? prope
oppidum Ta-chien-lu, *Pratt* (Nos. 283, 528), *Herb. Kew!*

Caulea 25-35 cm. longi, pennae corvinae crassitudine. Folia 3-5 cm.
longa, 2.5 cm. lata, segmentis ultimis vis 1 mm. latis. Flores
calyce 8 mm. longo, 4.5 mm. lato, dentibus 4 mm. longis, vis
1 mm. latis, sinibus obtusis; corollae tubo 14 mm. longo; limbo
4.5 mm. lato; labio postico 2.5 mm. longo, 6 mm. lato; labio antico
7 mm. longo, 7.5 mm. lato.

The description of this plant departs from the generic characters
assigned to *Phtheiospermum* in the anthers being bearded. There are
however, some hairs present on the margin of the rim towards the
base of the anthers of *Phtheiospermum chinense* Bunge, in *Herb. Calcutta*
specimens. The ovary is almost as hirsute (though the individual



A. L. Singh del.

PHTHEIOSPERMIUM TENUISECTUM Bur & French.

K. P. Dass lith.

hairs are shorter) in *P. chinense* as in the present species. The chief differences are that in *P. chinense* the lower lip is, relatively to the upper, much smaller than in this; and that in *P. chinense* the stigmatic lobe is that normally characteristic of the *Euphrasia*, viz., mid-lobe of lower lip outmost in bud, overlying first one (usually the left), then the other lateral lobe, the upper lip nestling under these. Here, on the contrary, while the lobes of the upper lip are inmost as before, they are immediately overlaid by the mid-lobe of the lower lip, and the latter in turn is covered by, first, the right, and then the left lateral lobe.—D. Prain.

Fig. 1. Anthesis. 2. Flower x2. 3. Calyx, laid open x2. 4. Corolla, laid open x2. 5. Anther, front and back x4. 6. Dioecium and ovary x4. 7. Section of ovary x4.

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Part II. No. 4, 1900.

XIX.—Description of a new Himalayan genus of Orobanchaceae.—

By J. S. GAMBLE, M.A., P.R.S., and D. PRAIN.

[Received 7th August; Read 5th October, 1900.]

GLKADOVIA Gamble & Prain.

*Calyx* tubulosus, parum inflatus limbo sequaliter 5-lobus. *Corollae* tubus parum incurvus, labium posticum incurvo-erectum concavum minopere emarginatum, antium brevius suberectum lobis 3 subaequalibus erectis. *Stamina* inclusa filamentis apice in connectivum conicum dilatatis, antherarum loculi asquales adnati basi divergentes et mucronato-aristati, *Ovarii* placent 4, per paria approximate, medioque confluentes; stigma dilatatum late aequaliter 2-lobum.—*Herba* parasitica carnosa rhizomate incrassato, squamis ovatis suffulta. *Flores* densius paniculati, pedicellati, 2-bracteolati. *Color* pallide purpurea.—Species singularis, Himalaica.

The interesting plant for which we propose the above generic description was discovered in Janssar in 1898 by the officers of the Imperial Forest School, Dehra Dun to whom we dedicate it to Mr. F. Gleadow, who was the first actually to find it.

Our plant has all the characters of a *Chrotsonia*, but cannot be referred to that genus because both anther-cells are perfect, because the corolla is very markedly 2-labiate in place of being sub-equally 5-lobed, and because the two stigmatic lobes are equally large.

The nearest ally of our plant seems to be the American genus *Conopholis* Wallr., with which it agrees in regards corolla and, except that they are not exerted, as regards stamens, but from which it differs in having an equally 5-lobed calyx and a 2-lobed stigma. From

*Boschniachia* C. A. Mey., it differs somewhat as regards corolla and very greatly as regards stamens. From *Xylanche* Beck (*Boschniackitt himalaica* R. f. & T.), it further differs in having 2 carpels, not 3, From all the genera mentioned it differs markedly as regards inflorescence, which in those is spicate, in our plant paniculate.

GLEADOVIA RUBORUM *Gamble* *fy Prain*.—A fleshy herb about 6 in. high of which only about one half epigaeal *j root-stock* very thick especially where attached to the host; *scales* ovate, the lower rounded, the upper acute sometimes 2-fid. *Flowers* paniculate; bract solitary, 7 in. long, sheathing, rounded, pedicel stout 35 in. long, bractceoles 2, 7-1 in. long, spatulate, acute, concave. *Calyx* light-red, tubular, somewhat inflated, regularly 5-lobed, M\*2 in. long, lobes pale. *Corolla* red with darker veins, tube as long as calyx, slightly curved, distinctly two-lipped; upper lip of 2 connate lobes, rounded, slightly deucate, lower of 3 narrow, spatulate, subequal, acutely dentate lobes. *Stamens* 4, geniculate at point of insertion, anthers elongate, spurred, connective produced in a 2-fid cone, hairy above. *Ovary* 1-celled, ovate-cylindric; style long, incurved at apex; stigma of 2 broad semi-orbicular lobes depressed in the centre; placenta 2 pairs, free below and above, confluent in the middle, diffuse; ovules very many. *Seeds* Wj many, minute.

N. W. HIMALAYA:—Bodyar Jaunsar, 8-9,000 ft.; on the northern slopes in very shady woods of Fir and Deodar on roots of wild Kaspberry (*Ubus ntiew*); very scarce, *Qkadow!* *Gamble!* *Duthie!* *Duthie's Collectors!*



[Sprinted from the *Indian Forester*, XXVII, No. 2, for February 1901.]

## A new Assam Timber-Tree\*

Br D. PKAIN, I.M.S., P.L.S.

In October 1886, Mr. Barker, of the Forest Department, called attention to the existence of a tree which he was unable to identify, occurring at the foot of the hills in the North Lakhimpur district and known to the Assamese as the "Sia Nahor." He had submitted specimens for identification to the Forest School at Dehra Dun, but having received no definite reply he sent a flowering example to the Calcutta Herbarium. Mr. Barker's specimen was not a very good one; it sufficed, however, to show that while "Sia Nahor" belongs to the same natural order as the "Nahor" proper (*Guttiferss*), it is not like "Nahor," a *Mesua* but a *Kayea*. The specimen sent was, as a matter of fact, tentatively referred to *Kayea floribunda*, a not uncommon tree in the lower hill forests of Sikkim, Bhootan, Khasia, Cachar and Lushai, known in Cachar and Sylhet as "Kurun" (*Wailich*) or "Kurul" (*O. Mann*). The flowers of Mr. Barker's specimen were, however, so much smaller than those of *Kayea floribunda*, that it was clear from the first that "Sia Nahor" was at least a distinct variety of "Kurul."

Nothing further was heard at Calcutta of Sia Nahor for thirteen years when, in December 1899, Mr. Young, Deputy Conservator, sent a set of specimens, this time in fruit, for identification. Mr. Young writes as follows:—"The tree is to be found on the north bank only, and is most plentiful immediately under the hills in the North Lakhimpur sub-division. This fact probably accounts for its absence from Peal's list of Assam Timber trees, as I understand his collection was confined to the south bank of the Brahmaputra.

<sup>1</sup> "The tree is large, with a straight bole 60 feet and more to the first branches, bark grey, wood close-grained, hard and very heavy. It is said to be very good for structural purposes, but decays rapidly in contact with the soil."

An examination of Mr. Young's fruiting specimens made clear that the *Sia Xalior* was not *Knyca jWihnda*, but before preparing a formal description, fuller material was desirable. Mr. Young was accordingly asked to send flowering specimens correspond with the fruiting ones already sent. With this request Mr. Young very courteously complied in June 1900. These plainly showed that in "Sia Nahor" we have to deal with a hitherto undescribed species of *Kayea*. To make this absolutely certain, the material now available was submitted to Sir George King, who has kindly compared the specimens with those in the collection at Kew, and in confirming the view that the species has not before been described, has kindly undertaken responsibility as to its name. A formal description of the tree is given below.

KAYEA ASSAMICA King # Train. A tall handsome glabrous tree, bark grey, wood hard, close-grained; young branches pale slender, cylindrical. Leaves opposite, firmly coriaceous, entire, ovate-lanceolate, base cuneate, apex shortly caudate-acuminate, nerves numerous, equal, slender, one-eighth of an inch apart, not prominent on either surface, upper surface somewhat shining, lower dull length, 3-5-4-5 in.; width, 1-35-175 in.; petiole slender 1/4 in. long. Flowers, in slender, terminal and axillary panicles, 3-6 in. long, branches of panicle short, slender, glabrous, pedicels in flower very slender 1/2 in. long, in fruit elongated and thickened, bracts and bracteoles at base of branchlets and pedicels 2 opposite, small, caducous. Sepals 4, imbricate, outer pair orbicular 1/5 in. long, much enlarged in fruit, inner wide-spathulate, apex rounded. Petals 4, shorter than sepals, suborbicular, 1 in. long, thin, white. Stamens many, filaments free, capillary, longer than sepals; anthers globose. Fruit globose; covered by the thick accrescent calyx tipped by the remains of the style, 1/8 in. across. Seed solitary.

ASSAM; North Lakhimpur, near the foot of the hills, common; Barker! Young!

The species is most nearly allied to *Kayea floribunda* which, however, differs markedly in its much longer leaves, narrower for their width, with fewer more arching nerves which are much more prominent beneath; in its more copious racemes with larger flowers and in its much larger fruit which is 1-5-175 in. across.

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