

<p><i>Ærua scandens</i>, <i>Wall.</i> (<i>Æ. velutina</i>, <i>Mog.</i>) <i>Piper</i>, <i>aff.</i> <i>P. canino</i>, <i>Dietr.</i> <i>Myristica</i>, <i>cf.</i> <i>M. insipida</i>, <i>R. Br.</i> <i>Loranthus</i> (§ <i>Dendrophthoe</i>), <i>sp.</i>, <i>aff.</i> <i>L. rigido</i>, <i>Wall.</i>? <i>Ficus</i>, <i>aff.</i> <i>F. acanthophyllæ</i>, <i>Miq.</i> — spp. (Three species in-</p>	<p>determinable from the material.) <i>Fatonia pilosa</i>, <i>Gaud.</i> (<i>F. lanceolata</i>, <i>Dene.</i>) <i>Lycopodium carinatum</i>, <i>Desv.</i> — <i>Phlegmaria</i>, <i>L.</i> <i>Polypodium irioides</i>, <i>Lam.</i> <i>Pteris tripartita</i>, <i>Sw.</i> <i>Asplenium falcatum</i>, <i>Lam.</i> <i>Vittaria elongata</i>, <i>Sw.</i></p>
--	---

This collection, so far as it goes, is made up in great part of the more widely diffused species of the Indian archipelago.

The most interesting plants appear to be :—

A plant, in fruit only, which I would refer to the Meliaceous genus *Owenia*, perhaps indeed to *O. cerasifera*, F. Muell., of Queensland.

A fine *Mucuna* in fruit, of the section *Stizolobium*, which I have not identified.

A *Delarbreia*, an Araliaceous genus hitherto only received from New Caledonia.

A plant, in fruit only, which may be something new, though possibly a *Strombosia* (Olacineæ).—[D. O.]

Remarks on *Cinchona Ledgeriana* as a Species.

— By EDWARD MORELL HOLMES, F.L.S.

[Read 20th November, 1884.]

THE name *Cinchona Ledgeriana* appears to have been first used in *Cinchona* plantations in the East Indies, to distinguish the trees grown from seed collected in the northern portion of Bolivia by an Indian servant of Mr. Ledger's, and which was subsequently distributed to Java, various plantations in India, and Ceylon.

When the plants flowered, Mr. J. E. Howard figured in his magnificent work 'The Quinology of the East-Indian Plantations' three forms of *Cinchona* which he had received from Java, as the produce of Ledger's seedlings, under the name of *Cinchona Calisaya* var. *Ledgeriana*, and gave a brief botanical description of the plant, by Dr. Weddell, in the accompanying text.

These illustrations represented respectively the male, female, and neutral forms of the plant. Notwithstanding the publication of these excellent coloured plates, there seems to have been ever since a considerable doubt among planters as to the characters by which the *Cinchona Calisaya* var. *Ledgeriana* might be recognized.

In consequence of this difficulty, Dr. Trimen published in the 'Journal of Botany' for Nov. 1881 figures and a description of what he considered to be the typical plant, and erected it into a species under the name of *Cinchona Ledgeriana*, Moens.

To this description Mr. Howard objected that the plant figured did not correspond with what he considered to be the typical *Ledgeriana* plant, as described by himself, and expressed the opinion, judging from the illustration alone, that Dr. Trimen's plant might be *C. micrantha* var. *calisayoides*. He also came to the conclusion, without seeing specimens of the tree, that the *Ledgeriana* described by Mr. T. N. Christie, of Ceylon, was probably *C. Calisaya* var. *microcarpa* of Weddell; but that those grown on the Yarrow Estate in Ceylon, by Mr. Laurie, were the true plant as described by himself under the name of *C. Calisaya* var. *Ledgeriana*, Howard.

Dr. Trimen, however, states positively that the three plants alluded to were all raised from the same small quantity of seed in the same nursery beds, and at the same time, and that they are all positively identical.

For my own part, I should have been content to have accepted the statement of either authority as final; but having received for the Museum of the Pharmaceutical Society three specimens of Cinchona-bark labelled "*Ledgeriana*," one of which was sent from Darjeeling by Dr. King, another from Ceylon by Mr. T. N. Christie, through the Planters' Association there, and a third from Java presented by Mr. Howard himself; and finding that all three differed in their external characteristics, only the Darjeeling one presenting the typical characteristics of *Calisaya* bark, I could come to no other conclusion than that several different varieties or forms, one or more of which are probably hybrids, are now grown in plantations under the name of *Cinchona Ledgeriana*.

Dr. Trimen, I believe, holds that the bark of Cinchona-trees does not present sufficient character for determination of species or affinity. My experience, however, on this point accords better with that of Mr. Howard, viz. that each species

when mature presents a bark distinguishable both by external and internal characters, and that hybrids generally give some indication of the species to which they belong by the characters of the bark.

My grounds for this belief are the following. Specimens of the different varieties of *Calisaya* from wild trees and from cultivated trees in Bolivia, and from cultivated trees in Darjeeling, can be easily recognized as belonging to one type; and the same holds good with the typical forms of *C. officinalis* and *C. succirubra**.

As a further illustration that the bark of trees of nearly allied species is easily distinguishable, I may appeal to a specimen of the flowering Ash, *Fraxinus Ornus*, L., now in the Botanic Gardens at Regent's Park, which was grafted many years ago on the trunk of the common *Fraxinus excelsior*, L. Here the difference in the two barks, above and below the line of juncture, is easily recognized.

The chemical analysis of Cinchona-bark also gives some clue to the species from which it has been derived, in the relative quantities and character of the alkaloids and colouring-matters prevalent in it.

So far as I am able to judge from the point of view of the physical characters of the bark, I am prepared to state positively that the *Cinchona Ledgeriana* from Darjeeling is undoubtedly that of a form of *Cinchona Calisaya*; and that in my opinion the specimen sent by Mr. Christie is a hybrid, apparently between *C. Calisaya* and *C. officinalis*, and that the one I received from Mr. Howard approaches more nearly in appearance to the *Calisaya* type than any other, although bearing some traces of hybridization with *C. officinalis*.

The history of the collection and distribution of Ledger's seeds also seems to support the view that the *Cinchona Ledgeriana* now in cultivation is not one well-marked species or variety, but embraces several varieties, some of which may be hybrids.

Thus Mr. Clements Markham, in his interesting work on Peruvian Bark (p. 214), distinctly states that the seeds were collected from about fifty trees. It is hardly to be supposed that these trees, in a district where the tree abounds, and of a species so variable as *Cinchona Calisaya*, would all consist of

* Some specimens were placed on the table to illustrate this point.

*exactly the same form or variety**. The instructions given by Mr. Ledger to the Indian, on his return with the seeds, viz. to obtain *more* seeds of the roja, morada, and naranjada varieties of the Calisaya, indicate that these were the forms that he would have endeavoured to collect. Indeed Mr. Van Gorkom states that the Indian assured Mr. Ledger that the greater part of the seed came from "Roja" trees. Consequently, when these seeds became distributed, the seedlings should have possessed the characters of this and of other varieties of the Calisaya stock.

The further history of these seeds indicates that such was the case. Thus, Dr. Trimen remarks (Journ. Bot. Nov. 1881), "In India the young plants were not distinguished from other yellow bark trees" (p. 322). Again, "The progeny of the original seeds shows a good deal of variation." "The upper surface usually has a velvety sheen or reflect" (p. 324). Again, Mr. Howard describes the first plants he received from Mr. Moens as a variety of *C. Calisaya*, referring them at first to the var. *microcarpa*. He afterwards (Quin. E. I. Plant. p. 85), however, considered that they possessed sufficient differences in the small size of the flowers and fruits to be made a distinct variety, in which he was supported by the celebrated botanist Dr. Weddell, who, it must be remembered, had himself collected *Cinchona Calisaya* in its native haunts. Mr. Howard moreover remarks that the microscopical structure of the bark presents very distinctly the Calisaya type. He had noticed, indeed, among specimens sent from Java, subvarieties differing somewhat in the shape and tint of the flowers and leaves, but presenting no features to separate them as other than varieties of the Calisaya type. He remarked, however, that the bark is proportionately thicker in some of Ledger's plants than in other varieties of *Calisaya*.

Dr. Kuntze (Journ. Bot. 1883, p. 6) speaks of the *Ledgeriana* of Mungpo as a large shrub with divaricately-panicled inflorescence with slender ramification, like that of *C. micrantha*, whereas the descendants of Bolivian *Ledgeriana* in Java and Southern India are trees.

Mr. Van Gorkom (p. 92) remarks that the Ledger seeds sown in Java developed into handsome young trees without any sign, at least on a hasty glance, of showing themselves distinct from

* Dr. Trimen remarks that there were some very bad trees of quite another type among those from the original sowing (Pharm. Journ. Jan. 19, 1884, p. 578, fnote).

the indubitable *C. Calisaya*, the offspring of Java seed, but that when in 1872 they began to flower, it was observed that the flowers were smaller and of a creamy-white colour. The fruit also gave evidence of difference from the other Calisayas in cultivation.

All plants of every other variety, except *C. officinalis* and *C. succirubra*, were subsequently turned out of the nursery, these being considered the most important to propagate. [This, however, it will be observed, was not before it had been possible for hybridization to take place.] When the plantations were reduced exclusively to Ledger's plants, it was noticed that the trees showed innumerable varieties of leaf; but after some experience it was found possible to point out with certainty the individuals of the common *Calisaya* which had slipped in, in repairing gaps. Still Van Gorkom admits that "there are many of the older *Calisaya* trees introduced by Dr. Hasskarl, which do not seem different from the *Ledgeriana*."

From the preceding remarks it may, I think, be concluded that the seeds supplied by Ledger resulted in a variety of forms of *C. Calisaya*, but that these were exposed to the chance of hybridization.

The probability that hybridization has actually taken place I ground upon the following facts: the specimens of bark already alluded to, which exhibit evidence of not being of pure *Calisaya* type; that Dr. Trimen states that in some plants of *Ledgeriana* the leaves are as broad as those of *C. officinalis*, var. *Condaminea*, so much so that it is not always easy to distinguish the two; that the bark presents considerable variability in appearance; that the upper surface of the leaves has usually (*i. e.* not invariably) a velvety sheen; and that the capsules he has seen are never "nearly globular" like those described by Dr. King. Dr. Trimen also states that, both in Sikkim and Java, the *Ledgeriana* trees have come more true from seed since those species growing in their proximity have been cut down (Journ. Bot. 1881, p. 322).

I take it for granted, then, that the *Ledgeriana* of the plantations is not a distinct form, but comprises several varieties of *Calisaya* as well as certain hybrids, and that the majority of these yield a large amount of quinine, this being the feature which is supposed to decide in doubtful cases (Van Gorkom, p. 93) whether or no a given tree is "*Ledgeriana*." It follows, then, that Dr. Trimen has described a species from doubtful materials, since he has taken the characters given, partly from

growing specimens in Ceylon, from seed obtained by Mr. Mac Ivor from trees which *originated* from Ledger's seed, and which, as above mentioned, may consequently have undergone hybridization with other species (Journ. Bot. 1881), and partly from dried specimens of the original trees from Java. The characters which he has selected from these as distinguishing the *Ledgeriana* do not, however, present any features which entitle it to be separated from *C. Calisaya* as a distinct species.

The distinctive features adopted by Dr. Trimen, and emphasized by italics in his description (Journ. Bot. Nov. 1881), are as follows :—

1st. Leaves always having the broadest part at or about the middle.

2nd. Flowers small, drooping, or divaricate. Buds not at all, or very slightly, widened at the end, and never abruptly enlarged there.

With regard to these characters, the first accords well with the figure of *C. calisaya* var. *microcarpa* of Weddell's plate (Notes, p. 50), and cannot therefore be used to separate it from the *Calisaya* type. The small flowers are also characteristic of Weddell's *C. Calisaya* var. *pallida*, which on this account he would have regarded as a var. of *micrantha*, with smaller and narrower leaves than the type, were it not for the difference in the fruit. In Dr. Weddell's type specimens in the Kew Herbarium the flower-buds of the *Calisaya* are not widened at the apex.

I conclude therefore that there is not sufficient evidence produced by Dr. Trimen to show that his *Ledgeriana* is entitled to specific rank, or is indeed anything more than a variety of *C. Calisaya*. If, as Dr. Trimen states, and he is confirmed in his statement by Mr. Moens and Mr. Van Gorkom, the tree can be easily recognized in all plantations by the characters he has given, and if it be also characterized by yielding a high percentage of quinine, it is important that it should receive a distinctive name. As, however, Mr. Howard affirmed that the plant described by Dr. Trimen was not identical with the one described by him under the name of *Ledgeriana*, and as the *Ledgeriana* bark I have received from Ceylon is certainly not identical with Mr. Howard's bark so named, it would be advantageous, I think, that Dr. Trimen's plant should be distinguished as a horticultural form, belonging to the variety *pallida* of *C. Calisaya*, and differing from it chiefly in the presence of scrobi-

cules (a feature which may be used to separate forms, but not varieties), until it can be ascertained definitely whether it is identical with the type of Weddell's *pallida*.

Doubtless there may be found among the descendants of Ledger's seeds some other forms of *Calisaya* already described by Weddell, as well as some hybrids yielding a large percentage of quinine; indeed this seems probable from the fact that Mr. Howard's *Ledgeriana* yields a large percentage, and is yet different from Dr. Trimen's plant.

I would suggest, therefore, to planters that herbarium specimens, gathered when in fully formed fruit, and accompanied by a characteristic portion of bark, should be kept for reference, of all forms that present a recognizable difference in habit of growth, appearance of bark, typical form of leaf, size and structure of flower, and shape and size of fruit. In this way only can the tangle be unravelled into which the mixture of a variety of seeds supplied by Mr. Ledger has led botanists.

Note on *Ranunculus Lingua*, Linn.

By FREEMAN C. S. ROPER, F.L.S., F.G.S.

[Read 18th December, 1884.]

(PLATES XIII. & XIV.)

RANUNCULUS LINGUA is a plant very generally distributed in Britain, as it was recorded from 72 counties in Watson's Topographical Botany, and is stated in the second edition to occur in 77 counties. But it appears to be local and sparingly distributed in most parts of England; and I have only seen it in three localities in this part (Eastbourne) of Sussex. It is probably from this cause that the early primordial submerged leaves appear to be very little known, or generally overlooked; at all events, they are very rarely noticed by botanical writers. The specific descriptions given by the great majority of authors have been drawn up from the aerial leaves alone; and these differ so widely from the early submerged leaves that no one would imagine that they belonged to the same plant. I think, therefore, it may be useful to direct attention to these early leaves, of which the accompanying sketches are accurate representations, drawn to scale of about half the natural size.

On looking through the botanical works I have available, I