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# MADRAS RECORD OFFICE.

## Government of Madras.

REVENUE **DEPARTMENT.**

G.O. No. 1189 Press / ~~Mis.~~

Dated 26-9-1883.

***Not to be folded or roughly handled***

*CONFIDENTIAL.*

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

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READ—the following letter from Dr. H. TRIMEN, Director, Royal Botanical Gardens, Ceylon, dated 30th June 1883 :—

ABSTRACT.—Forwarding his report on the Government Cinchona plantations on the Nílgiris.

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READ—also the following official memorandum, dated 16th August 1883, No. 282 :—

The undersigned is directed to request that the Director, Government Cinchona Plantations, Parks, and Gardens, Nílgiris, will be good enough to favor Government, at the earliest possible date, with such remarks as he may desire to make on the botanical portion of Dr. Trimen's recent report on the plantations under his charge.

2. With reference to the practical suggestions made in paragraph 2 of that report, and with reference to G.O., Mis. No. 294, dated 23rd January 1883, Mr. Lawson's views as to the necessity for the appointment of a quinologist should be submitted. On this point, the views of Dr. Bidie will also be most acceptable to Government, and it would be convenient if those views could be submitted, together with any general remarks on the botanical portion of the report, in a joint memorandum in answer to this reference, a copy of which, together with a copy of Dr. Trimen's report, will, for that purpose, be forwarded to Dr. Bidie.

3. With reference to paragraph 26, Mr. Lawson will report whether he considers the appointment of a propagator necessary, and whether any one answering the requirements of the case can be found or trained on the spot, in order that the necessity for sending to England for another gardener may be avoided. With reference to paragraph 31, copies of the orders of Government, noted in the margin, will be forwarded to him, and his matured opinion on both points raised will be submitted.

G.O., 3rd Aug. 1882, No. 806.
" 22nd Dec. " " 1473.
" 15th Aug. " " 852.

4. A fair copy of Dr. Trimen's report will be substituted for the rough proof already communicated as soon as received from the press.

(Signed) H. E. STOKES,
Acting Secretary to Government.

To the Director, Government Cinchona Plantations,
Parks and Gardens, Nílgiris, with copies of three G.Os.

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READ—also the following letter from M. A. LAWSON, Esq., Director of the Government Cinchona Plantations, Botanical Gardens, and Parks, Nílgiris, to the Secretary to Government, Revenue Department, dated Ootacamund, 10th September 1883 :—

I have the honor to forward to you my "report" on the present condition of the Government Cinchona plantations, which have been placed under my charge,

and on the changes which, I think, should be made in their treatment, in order to secure a permanent even yield of bark and their more economical up-keep. I have also the honor to report to you my opinion as to the desirability of Government obtaining the services of a skilled quinologist, as suggested in Dr. Trimen's "report;" and again as to the feasibility of Colonel Henderson's scheme for the establishment, with the aid of Government, of a private company for the manufacture of the Cinchona alkaloids on the Nilgiri plateau.

### The present Condition of the Plantations.

*Dodabetta.*—This magnificent plantation occupies 314 acres, and consists almost entirely of *Cinchona officinalis*. The trees are, for the most part, in fine condition, and, judging from their appearance, I should say that, taking the estate as a whole, it has not yet reached its full prime; the trees upon the oldest plots being robust and renewing their bark as well as when younger. In some portions of the estate, however, where the soil is poor, or the exposure to the winds of the south-west monsoon too direct, the trees show manifest signs that they are past their prime. This is specially the case on plots 5 and 6, which cover an area of about eleven acres; and I should recommend that the trees on these plots be at once either coppiced or up-rooted and the plots replanted.

I think the Government may confidently expect that the yield of bark from this estate will continue slightly to increase for some years to come.

*Naduvatam.*—This is another fine estate, the planted portion of which comprises 301 acres. The trees are chiefly *Cinchona succirubra*, though interspersed with these are many other kinds, notably *C. officinalis* and the presumed hybrid between *C. officinalis* and *C. succirubra*, viz., *C. robusta*, or, as it is more commonly called in this neighbourhood, *C. pubescens*. In the more favorably situated portions of the plantation, the *C. succirubra* and *C. robusta* are still growing vigorously, and show no signs of their having yet reached their prime; the older and larger trees renewing their bark as well and as rapidly as the younger ones. There are, however, many parts of the estate, where, owing either to an evil exposure or to poverty of the soil, or to both of these causes combined, the trees are not only past their prime, but are dying off by thousands. I would recommend that those portions of the estate, which are most unsatisfactory, should be given up altogether, while the trees upon the remainder should at once be either coppiced or dug up, and their places filled with young plants.

With respect to the yield of bark from this estate, I think the Government would be wise to calculate upon a slight decrease for at least the next few years.

*Hooker.*—This plantation, the site of which has been most infelicitously chosen, contained at one time 151 acres, planted with *C. succirubra*, *C. robusta*, and *C. officinalis*. The estate has generally been much neglected, and the trees, none of them healthy, are, for the most part, in a piteous condition. Hail, wind, frost, and a naturally intractable soil have rendered whole region desolate.

I should recommend that the estate cease to be cultivated, as to repair the ravages of past neglect would entail an outlay which, I believe, would never be remunerative. It is, moreover, situated four miles distant from Naduvatam, under the management of whose head overseer it has been placed.

*Wood.*—Another plantation, occupying about 72 acres, and like the last unsatisfactory, both on account of its neglected condition, its more or less poor soil, and its liability to injury through the invasion of sambre, pigs, and other pests. It is placed under the management of the assistant superintendent at Dodabetta, from whose residence it is distant twenty miles.

I would recommend that the cultivation of Cinchona on this estate be given up.

*Frogmore.*—Taking into consideration the unsatisfactory condition and inconveniently distant position of the Hooker and Wood estates, I would propose that they should be either sold by auction as they stand, or that the trees upon them should be uprooted and the bark realised in the ordinary way. I am inclined to think that the latter mode of disposing of the estates would be the most profitable, as I doubt if an adequate bid would be made, if they were put up to auction. I



would next propose that the proceeds of the sale of the estates or of the bark should be devoted to opening out small tracts of land (say two acres in extent) at varying elevations in different parts of the Presidency, where the best varieties of Cinchona may be grown, and reliable information furnished respecting the height at which, and the climatic conditions under which, each may be most profitably cultivated. Again, it is very desirable, for the purpose of securing reliable seed, that a few plots of ground should be taken up at such a distance from all Cinchona plantations as would render hybridisation impossible. In each of these plots one variety only should be planted, and grown only with the view of raising seed.

All the tracts of land above mentioned might also be made available for experimenting upon plants other than Cinchona.

### Dr. Trimen's Report.

*Botanical Observations.*—With respect to the conclusions at which Dr. Trimen has arrived in regard to the botanical aspects of Cinchona culture, I have only to remark that the experience I have gained since I came out to India leads me to adopt them as my own. I think, too, with him that it is most desirable that there should be an uniform nomenclature, and we are to be congratulated that his recent visit to the original Cinchona plantation in India has enabled him to decide what name ought to be maintained in the case of all the more important species, varieties, and presumed hybrids. In a short time, with Dr. Trimen's assistance, I hope to be able to furnish you with a list of all the different kinds of Cinchona growing in India and Ceylon, together with their synonymy.

*Practical Suggestions.*—Dr. Trimen suggests (paragraph 26) that a good propagator should be hired, who should have for his duties the performing of experiments in artificial hybridisation, in calculating the relative value of the stripping and shaving processes, &c. All this, however, I think can be done by those at present employed on the estate.

Dr. Trimen's other suggestion (paragraph 28), viz., that a quinologist is a necessity, is one, the force of which I feel every day. In order that any further advance may be made in the practice of Cinchona culture, it is absolutely necessary that we should be able to have analysed a very large number of our trees in different stages of their growth, when treated under different systems and when grown at different altitudes. Whether, however, it would be better for Government to re-establish the laboratory over which Mr. Broughton formerly so worthily presided, or whether the required analyses could not be obtained in some other way as well done and more cheaply, is a matter on which I shall dwell when discussing the feasibility of Colonel Henderson's scheme.

### Colonel Henderson's Scheme for establishing a Manufactory of Sulphate of Quinine and other Cinchona Alkaloids on the Nilgiri Plateau.

In the despatch of the Right Honorable the Secretary of State, dated 21st December 1882, I was desired to inform this Government, so soon as I had gained the necessary experience and local knowledge, of my views as to whether or no it would be of advantage to this country that Colonel Henderson's proposition to establish a factory for the extraction of the Cinchona alkaloids should be accepted. I have carefully considered this question, and I have now the honor to report—

(1*st*) that I believe it would be possible, eventually at least, to extract all the Cinchona alkaloids as well here as in England, or elsewhere;

(2*ndly*) that a private manufactory would be more desirable than one maintained by Government.

With respect to the first point, the reasons I have to give for my belief are—

*A.*—Although it is possible that the more expert English or continental manufacturers may at present be able to extract a larger per-centage of alkaloids than is likely to be obtained by the less skilful operators in this country, it is to be remembered that this superiority would decrease in proportion as the workmen gained that dexterity which,

it may be presumed experience would give them. Also it may be taken for granted that the rapidly increasing knowledge, by which chemical methods and mechanical contrivances are being constantly improved, will tend to destroy any monopoly of trade secrets, and that, in the future, the manufacturer will have to seek for the elements of success more in his contiguity to the regions in which the bark is grown, and, to a smaller extent, to the market in which his drugs are sold, than to his being the sole possessor of some particular method, by which he can produce his commodity a trifle cheaper than his neighbour.

*B.*—There are various expenses connected with transport, freight, &c., which would be saved; and this sum,—not a small one,—would be divided in portions, according to the energy displayed by each, between the grower, the manufacturer, and the consumer. And supposing that, as in the ordinary arrangement of such transactions, the manufacturer obtained the larger share, he would be able to use a no inconsiderable sum as a set off against his supposed want of preliminary dexterity and non-possession of a secret.

The following estimate of expenses connected with the transport of bark to England, though a rough one, is sufficiently accurate, and will show nearly enough the amount which would be saved on a ton of Succirubra bark. I take Succirubra bark because that is the most common sort on these hills, and will remain so for many years to come:—

| *Indian Charges.* | Rs. | A. | P. |
|---|---|---|---|
| Cost of transport of one ton of bark to the coast .. .. | 40 | 0 | 0 |
| Coast charges (packing) .. .. .. .. .. .. | 40 | 0 | 0 |
| Total .. | 80 | 0 | 0 |

| *English Charges.* | £. | *s.* | *d.* |
|---|---|---|---|
| Freight, landing charges, &c., = 15 per cent. on product of sale. One ton of Succirubra bark at 1*s.* 3*d.* per pound = £140 .. .. .. .. .. .. .. | 21 | 0 | 0 |
| Shrinkage .. .. .. .. .. .. .. | 4 | 18 | 0 |
| Total .. | 25 | 18 | 0 |
| Taking the rupee as worth 1*s.* 8*d.*, the Indian charges are .. | 6 | 11 | 4 |
| Total sum connected with transport freightage, &c., which would be saved .. .. .. .. .. .. | 32 | 11 | 4 |

With respect to the second point, I think that a private company would carry on the manufacture of the Cinchona alkaloids with greater advantage than would be done by Government for the reasons that—

(1*st*) there would be no ground for the cry, reasonable or unreasonable, that Government were interfering with private enterprise;

(2*ndly*) that, as the Government could make use of the quinologist, who would be attached to the factory for the purpose of analysing the bark of such trees as might be necessary for re-solving vexed questions, they would attain this desirable end at a cheaper rate than they would, if they were to employ a special quinologist of their own.

I would, therefore, recommend that Government should favor the establishment of a factory, such as has been proposed by Colonel Henderson; and in order that the capital necessary for starting the industry may be obtained, I would suggest that the following concessions and stipulations should be made:—

(1) That the company should be given a plot of ground of such extent and in such a place as the promoters may consider most suitable for the purposes of their factory. Such plot to revert to Government whenever it should be disused as a site for the purpose for which it was granted;



(2) That, for a specified term of years, say five, the company be allowed to import or make, free of duty, such chemicals as they may need for the purposes of their trade; the company undertaking, at the same time, to adopt such measures as the Government may think necessary to prevent fraud;

(3) That, for a similar number of years, the company shall be furnished by Government, at cost-price, with the necessary amount of fuel;

(4) In consideration of these concessions, the company shall undertake to obtain the services of a competent quinologist, who shall be approved by Government, and who shall have for a part of his duties the analysis, at cost-price, of all such specimens of bark as the Director of the Government Cinchona Plantations shall think necessary—

(*a*) for the purposes of scientific experiment;

(*b*) for the purpose of obtaining the market-value of any bark, which they may propose to offer to the company for sale. It being understood, at the same time, that the Government will not consider themselves bound to complete the sale, should they, for any reason, afterwards think fit not to do so.

The following palpable objections may be raised to this scheme:—

(1) What assurance could be given that, in the interest of the company, a dishonest quinologist might not return the Government bark as of a lower than its real value?

(2) How shall an arrangement be arrived at, which shall be satisfactory at once to the Government as growers and to the company as manufacturers, as to the proportion which shall be awarded to each, of the savings which will be effected in respect of the expenses, formerly connected with transport, freight, and other charges.

With respect to the first objection, I would observe that in any case of dishonest dealing on the part of the company's quinologist, it would always be possible to check the result of his analyses by sending samples of the same bark to some chemist, whose reputation would place him above suspicion.

With respect to the second objection, I can only suggest that in case of disputes arising recourse should be had to arbitration.

Within the last few days, Government have authorised the sale, by auction, of a portion of their bark in Madras, and this, if it is allowed to be generally understood that such sales will be constantly held, will, I believe, be productive of much advantage to all growers of Cinchona, inasmuch as it will tend to induce buyers to make their purchases in this country, and so enable growers to dispose of their bark more readily than they have hitherto been able to do.

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ORDER—dated 26th September 1883, No. 1189, Revenue.

Miscellaneous.

The first portion of Dr. Trimen's report, which deals with the botanical problems presented by the Nilgiri Cinchona plantations, will now be communicated to the officers concerned and to the editors' table, and will be advertised in the *Fort St. George Gazette* for sale to the public. Dr. Trimen, in common with all other authorities on the subject, finds Mr. Cross to have been altogether wrong on the *Succirubra-Micrantha* question, and agrees with the authorities at Kew in considering the varieties locally known as *Pubescens* and *Magnifolia* to be hybrids between *Officinalis* and *Succirubra*. In these conclusions, Mr. Lawson agrees, and the questions lately discussed may now, in the opinion of the Right Honorable the Governor in Council, be considered to have received as authoritative a settlement as the nature of the case allows.

2. The Government entirely agree with Dr. Trimen in considering uniformity of specific nomenclature most desirable, and desire the Director to adopt the suggestions made on this subject.

3. The second portion of Dr. Trimen's report, which contains some valuable observations upon the principles which should regulate the future management of the Cinchona plantations, must be considered with the Secretary of State's despatch, No. 41, dated 21st December 1882, calling for Mr. Lawson's views as to the management of the plantations and the best method of utilising their produce, and with Mr. Lawson's report above read. In this connection it will also be necessary to advert to Colonel Henderson's scheme for the establishment of a private manufactory of quinine and Cinchona alkaloids on the Nilgiris.

G.O., 23rd January 1883, No. 204.

4. At the outset it is necessary to admit that Dr. Trimen's charge that the estates have been managed too much with a view to revenue, cannot well be disproved. This, however, is perhaps a necessary incident of unscientific management, and the Government concur with Messrs. Trimen and Lawson in considering that this reproach should be removed by the early appointment of a quinologist to work under the orders of the Director. Cinchona cultivation is full of unsettled problems, in the settling of which chemistry, botany, and horticulture must work together. Mr. Lawson supplies the botanical science and horticultural art, but a chemist from home, who would be of great service not only to Government but to private Cinchona growers, is much wanted. His Excellency in Council resolves accordingly to urge on the Secretary of State the appointment of such an expert for the reasons given by Dr. Trimen, which he adopts in their entirety. This officer, if appointed, will necessarily be the servant of Government; but he will be allowed the free exercise of the right of private practice, provided that it does not interfere with the requirements of Government, who must have the first claim on his services.

5. It will be convenient here to advert to paragraph 3 of the Secretary of State's despatch, No. 41, of 21st December 1882, and to set forth the views of this Government as to the best method of utilising the produce of the plantations, which, it will be observed from Mr. Lawson's report read above, will probably be far less in the next, than it has been in the last, few years. Mr. Lawson, it will be seen, is in favor of adhering to the policy of stimulating a local demand for bark by local sales, and the Government are disposed to think that, for the present, such sales may be continued with advantage to all concerned.

6. It will be observed that Mr. Lawson is in favor of Colonel Henderson's scheme, and proposes certain concessions which Government might make, to enable a private company to establish a Cinchona factory on or near the Nilgiris. In principle, the Government also favor the scheme. The concession of fuel at cost-price would, however, be a very large one, while that of chemicals, free of duty, is inadmissible. With the exception of alcohol, no duty-paying substance will be largely required. For alcohol other industrial establishments have to pay duty, and, on principle, it would be difficult to exempt the proposed factory.

7. It must be noted that the continuance of local sales and the possible establishment of a local factory are additional reasons for the appointment of a quinologist, though it is not on these grounds that the appointment is considered necessary, but to meet the requirements of scientific culture and experiment apart from all questions of manufacture or of disposal of crop.

8. With reference to the proposed abandonment of the Hooker and Wood plantations, the Government consider that this question had better be postponed till a final settlement of the various questions of principle now *sub judice* has been arrived at. It is not improbable that the trees in those plantations may at no distant period have to be uprooted, and the cultivation carried on only on the better situated estates of Dodabetta and Naduvatam, where constant skilled supervision is available.

9. The Director will use his discretion as to the proposed operations at Dodabetta, turning them to account, as an experiment, as far as may be practicable. His Excellency in Council agrees with Mr. Lawson in thinking that no need exists for getting out a propagator from home; and, with reference to his proposals for experiments at elevations lower than the existing plantations, resolves to postpone consideration of the subject, pending the receipt of a report as to what has been done in the Malabar district under orders already issued.



(Here enter No. 19, dated October 1883, to the Secretary of State.)

(True Extract.)

(Signed) H. E. STOKES,
Acting Secretary to Government.

To the Director of Government Cinchona Plantations,
Parks, and Gardens, Nilgiris.

„ the Board of Revenue.
„ Dr. H. Trimen.

Exd. F. R. Dantleman.

21-10-83 ✓
28-7-83 ✓

# Govt. of {1883} Madras.

## REVENUE.

*Issued*

*Recd.* *Encl.*

G.O., 26th Sept. 1883, No. 1189.

SEPTEMBER.

**Government Cinchona Plantations, Nilgiris.**

Passing orders on reports from Dr. H. Trimen and Mr. Lawson on the —.





*CONFIDENTIAL.*

## REVENUE DEPARTMENT.

LETTER—

TO THE RIGHT HONORABLE
THE SECRETARY OF STATE FOR INDIA.

MY LORD,

With reference to your Lordship's despatch, No. 41, dated 21st December 1882, and to our letter, No. 29, dated 15th December 1882, we have the honor to forward a copy of Dr. Trimen's report, together with a copy of our proceedings* dealing therewith, and with Mr. Lawson's report containing his views as to the best method of utilising the produce of the Government Cinchona plantations, and as to their future management.

Miscellaneous.

* Dated 26th September 1883, No. 1189.

2. Our views may briefly be stated as follows:—We consider the appointment of a quinologist to be urgently called for as a necessary outcome of the policy inaugurated by Mr. Lawson's appointment, and in view to the scientific cultivation and management of the estates in future.

3. We think local sales might, for the present, be continued; the bark not disposed of in this way being sent home as heretofore, pending a decision by your Lordship as to its ultimate disposal.

4. We are in favor, in principle, of Colonel Henderson's scheme for the establishment of a local manufactory, and, should your Lordship now consider it feasible, we shall be prepared to enter into negotiations, in view to the arrangement of reasonable terms with reference to the remarks made on this subject in our proceedings of this date. Should the manufactory be ultimately established, a portion of the crop will be made over to it, at market rates, for manufacture.

5. With reference to the appointment of a quinologist, we have to express our opinion that this officer must necessarily be the servant of Government, and that under no possible arrangements could the plan of a joint quinologist answer. In our opinion, the pay offered should not exceed £500 a year. Mr. Broughton drew £1,000, but quinology has, subsequently to his appointment, made great strides, and as the officer selected must work under Mr. Lawson, his pay should be slightly less than that of that gentleman.

6. We believe, moreover, that there would be no difficulty in obtaining the services of a quinologist, with the necessary scientific acquirements, for the sum mentioned or even less, considering that private practice will be allowed.

We have the honor to be,
My Lord,
Your Lordship's most obedient, humble servants,

(Signed) M. E. GRANT DUFF,
( „ ) FRED. ROBERTS,
( „ ) DAVID F. CARMICHAEL,
( „ ) H. E. SULLIVAN.

Ootacamund,
*October* 1883.

Exd. F. R. Bantleman.

# FORT SAINT GEORGE.

*REVENUE (1883) DEPARTMENT.*

(Copy.)

**LETTER to the Right Honorable the Secretary of State for India.**

**Dated th October,**

**No. 19 of 1883.**

Forwarding, with remarks, reports by Dr. H. Trimen and Mr. Lawson on the Government Cinchona plantations, Nilgiris.



PERADENIYA,
30th June 1883.

From

DR. H. TRIMEN,
DIRECTOR, ROYAL BOTANICAL GARDENS,
*Ceylon,*

To

THE SECRETARY TO GOVERNMENT,
REVENUE DEPARTMENT.

SIR,

I have the honor to forward to you my Report on the Cinchona Plantations of the Nilgiris, which I have divided into two portions.

PART I.—BOTANICAL OBSERVATIONS.

1. In accordance with the invitation conveyed to me on 10th April that I would "inspect and report upon the Botanical problems presented by the Nilgiri Cinchona Plantations," I proceeded, with the sanction of this Government, to Madras, and reached Ootacamund on May 5th. During the succeeding fortnight I investigated the plantations at Dodabetta, Naduvatam and the Pykara river. Throughout the examination I was so fortunate as to have the company of Dr. Bidie—who has an intimate knowledge of the plantations—and of my old friend Mr. Lawson, who has lately been appointed Superintendent of them;* at Naduvatam we were joined by Major Campbell Walker, Conservator of Forests; Mr. Gass, Deputy Conservator of Forests, under whose charge the plantations actually were; and Mr. Lorne Campbell, a Member of the Cinchona Committee of 1878.

2. *Previous Preparation.*—In addition to a somewhat critical study of *Cinchona* made during my connection with the British Museum, and the facilities I have since enjoyed in Ceylon from an acquaintance with the cultivated kinds, I may add that during a visit home last year, I took the opportunity of renewing my acquaintance with the dried collections, both at Kew and the British Museum. At the former establishment, I paid special attention to the original specimens sent home from the Andes by Spruce and Cross and to Colonel Beddome's and Mr. Bidie's recently received series from these plantations; whilst at the Museum I re-examined chiefly the original type-specimens of Pavon, and a fine numbered set collected in the Nilgiri plantations themselves by the late Mr. McIvor in 1873, and presented by the Secretary of State for India.

3. *Botany of Cinchona in general.*—So many persons have reported upon the botany of the trees under review that they possess quite a small literature of their own, and it might be supposed that the subject was thoroughly exhausted. In past times Mr. Markham, the late Mr. McIvor, and especially Mr. Howard, and more recently Colonel Beddome, Mr. Cross and Dr. Bidie have paid particular attention to the troublesome questions connected with the nomenclature of the several kinds. With regard to some of these writers, I trust I am in no way forgetful of the many and great services that they have rendered to the Cinchona enterprise when I feel bound to say that from the botanical point of view, I think it is much to be regretted that circumstances should have thrown this very difficult genus into the hands of those who have had so little of the requisite training and experience in systematic botany for dealing with it effectively. It ought indeed to be generally understood, that however eminent a writer may be as a quinologist, a traveller, or a gardener, if he can see important botanical characters in the height of a tree, the chemical constitution of its bark, or the colour if its leaves, he is *ipso facto* disqualified to pronounce on questions of classification. A number of published names have, however, been defined by nothing more than some such botanically trifling or variable distinctions, and should not be recognised until properly characterized. There is nothing about the genus *Cinchona* in its botanical aspects to warrant it being treated on any principles different from those which the systematist is ordinarily accustomed to employ: for authors who know little of those principles or have had no experience in the application of them to other groups of plants to attempt to arrange the forms of so involved and complicated a genus as this, can only lead to failure and confusion.

* At the time of my visit, Mr. Lawson had not been actually placed in charge.

It may be said that botanists themselves disagree largely on such points: their differences, however, appear greater than they really are. There is rarely any serious disagreement as to the relative value of characters, though there is much as to the *grade* which the individuals or groups defined by them should occupy. Thus a group which one naturalist will consider as a single species with several varieties will be four or five species to another; or a small set of allied species or a single isolated one may be regarded as a distinct genus by one botanist, and be relegated to some larger one by another. Such differences there must always be, for they represent the more or less synthetical or analytical bent of individual minds, but naturalists have long left off discussions over such matters, which, indeed, since the general recognition of affinity by descent, have lost entirely the significance they once had.

We possess, however, arrangements of the whole known species of *Cinchona*—worked out simultaneously but quite independently—at the hands of two eminent botanists both familiar with South America and the wild trees, the late M. Weddell of Paris and M. Triana of New Granada,* and it is to these works and especially to that of M. Triana that we have to go in the endeavour to find sound views as to the limits of the species (which are nearly all of extreme variability) and their correct nomenclature. Unfortunately in neither treatise are descriptions given; I venture to think that had M. Triana attempted to accurately define his thirty-six species he would have considerably reduced their number. Too many are still little more than varieties of *barks* distinguishable by the collectors or by merchants, and do not represent *plants* with such a combination of anatomical characteristics as is necessary to constitute a recognizable species.

4. *The kinds in cultivation in the Nilgiris.*—The now well-known story of the successive importation of different sorts of Cinchona from South America to the Nilgiris is told in official detail in the five blue-books (issued from 1863 to 1877) so far as to the middle of 1875, and has been briefly summarized in Major Campbell Walker's excellent report of 1878. It is much to be regretted that the late Superintendent's reports are so meagre in detail as to render it impossible from them, to trace with any minuteness the history of the kinds which thus came under his charge. The latest to which I have access is dated 31st July 1875 † and professes to give the botanical names and numbers of the plants of each "species" then cultivated. I need say nothing here about the *numbers* given; they have been since shown to be exaggerated to an almost incredible extent; but as to the *names*, the twelve kinds given were no doubt generally at that time distinguished in the plantations.

1. C. succirubra
2. C. Calisaya. ... ... ... Red Bark.
   Do. var. frutex
   Do. var. vera } ... Yellow Bark.
3. C. officinalis
   Do. var. Condaminea ... Original Loxa Bark.
   Do. var. Bonplandiana ... Select Crown Bark.
   Do. var. crispa ... ... Fine Crown Bark.
4. C. lancifolia ... ... ... Pitayo Bark.
5. C. nitida ... ... ... ... Genuine grey Bark.
6. C. species without name ... Fine grey Bark.
7. C. micrantha ... ... ... Grey Bark.
8. C. peruviana ... ... ... Finest grey Bark.
9. C. Pahudiana.
10. C. lanceolata-leaved variety of C. officinalis.
11. C. Pitayo. Raised from imported seed.
12. Do. Plants brought out by Dr. Simpson.

The nomenclature of the first nine kinds dates from Mr. McIvor's first report, 31st May 1862, but some changes had been made since that date. At that time *C. officinalis* was collectively called "*C. condaminea*" and the three varieties were respectively "var. *Uritusinga*," "var. *Chahuarquera*" and "var. *Crespilla*." No. 4 was then said to afford "Crown bark" (not Pitayo bark) and No. 9 at first went under the name of *C. lucumæfolia* of the Dutch.

Nos. 9 and 10 first appear in the returns for July 1869. No. 10 was the tree observed by Mr. Broughton in 1868 to be so rich in quinine, and provisionally called by him ‡ "var. *lanceolata*," which name was in 1872 altered, in accordance with Weddell's nomenclature, to var. *angustifolia*. The last, No. 12, was added in January 1871.

As a correct chronology is important it will be well to give, for easy consultation, the sources and date of reception of these various kinds which composed the plantations of July 1875.

* H. A. Weddell, Notes sur les Quinquinas; in Ann. des Sc. Nat., Botanique, ser. 5, XI, page 346, and XII, page 24, (1869).
J. Triana, Nouvelles Etudes sur les Quinquinas, Paris, 1870 [1872].
† Blue Book V, page 189. ‡ Blue Book III, page 237.



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|---|---|---|---|
| 1. | *C. succirubra.* | Seeds, South America, Spruce. | February 1861. |
| | | Plants, South America, Cross. | April „ |
| 2. | *C. Calisaya.* | Plants, South America, Cross. | „ „ |
| | | Plants, Java (originally collected in South America by Hasskarl in 1854), T. Anderson. | December „ |
| | | Seeds, South America, Markham. | „ 1865. |
| | | Seeds, Mr. Money (? Including *C. Ledgeriana*). | „ „ |
| | | Plants, Kew (originally from seeds collected in South America by Weddell) "*Josephiana, glabra.*" | „ 1866. |
| | | Plant, J. E. Howard, "superior variety." | „ 1867. |
| 3. | *C. officinalis.* | Seeds, South America, Cross. | February and March 1862. |
| | | Plant, J. E. Howard (from seed collected by Don Riofrio in South America). "*Uritusinga.*" | April „ |
| 4. | *C. lancifolia.* | Plants, Java (seeds originally collected in South America by Karsten), T. Anderson. | December 1861. |
| 5. | *C. nitida.* | Seeds, South America, Pritchett. | January „ |
| 6. | *C.* species without name. | | |
| 7. | *C. micrantha.* | | |
| 8. | *C. peruviana.* | | |
| 9. | *C. Pahudiana.* | Plants, Java (originally collected in South America by Hasskarl in 1854), T. Anderson. | December „ |
| 10. | Found among progeny of No. 3. | | |
| 11. | *C. Pitayo.* [*C. pitayensis.*] | Seeds, South America, Cross. | 1869. |
| 12. | —— | Plants, brought from England by Dr. Simpson. | „ 1870. |

Probably seeds or plants of *C. Ledgeriana* from the Government Plantation in Java were received in 1872—1875 or thereabout, but I find no record of their reception. Since the date of that Report the principal new sorts that have been brought into the plantations are the New Granadan (Columbian) Bark-trees. Mr. Cross arrived at Ootacamund on 8th October 1880 with three plants of *Santa Fe* (Soft Columbian) and six of *Carthagena* (Hard Columbian) which he had himself collected in South America. Quite recently, in March 1883, seed of varieties of *Calisaya* stated to be the "verde" and "morada" of Bolivia have been purchased from a London firm and numerous seedlings have been raised.

5. *The Hybrids, "pubescens" and "magnifolia."*—Mr. McIvor died in June 1876, and up to the arrival of Mr. Cross as above noted, the names in the list given above were generally recognised and used. In addition however to these, the two names at the head of this paragraph were also commonly employed to designate trees which it was believed resulted from the crossing of *C. officinalis* and *C. succirubra.* These were first brought prominently into notice by Mr. Broughton in 1869;* Mr. McIvor, in his report for 1869-70, also remarks on the readiness with which hybridization occurs and states that some "very interesting hybrid varieties" had been raised from seed. The name "*pubescens*" dates from 1872 when it was bestowed as a varietal (hybrid) name by Mr. Howard † on a plant, the bark of which afforded him a very high percentage of alkaloids; that of "*magnifolia*" seems to have arisen from a faulty identification of the leaves with the plate of *C. magnifolia,* Pav. in Howard's "Illustrations" ‡ by Mr. McIvor. The hybrid nature of these plants remained unquestioned, and their rapid increase led Mr. Howard to write in 1876 :§ "it seems difficult now to obtain seed from Ootacamund that is not hybridized." Dr. Bidie also in 1878 ‖ was much struck with the strong tendency of the species to cross and says of the "hybrid called *C. pubescens*" that "specimens submitted to Dr. King and myself.....show that it is a hybrid with a strong strain of the *officinalis* family, and apparently a cross between *C. officinalis* and *C. succirubra.*"

* Blue Book III, 239: V, 48, and Journ. Linn. Soc., XI, 475. † Journ, Linn, Soc., XIV, 160.
‡ Tab. 13. This represents a number of a different genus, and is now *Cascarilla magnifolia,* Wedd.
§ Quinol. Ind. Plant., p. 84. ‖ Appendix to Rep. of Cinch. Committee, pp. 42-45.

Similar experience was recorded as early as 1870 from Sikkim, Ceylon and Java, and up to the end of 1880 there was a general consensus of opinion as to the probable origin of the plants.

6. *Mr. Cross's and Colonel Beddome's opinions.*—In January 1881, Mr. Cross sent in a report on the plantations, which was printed in the following June. Early in the same year, the plantations having been transferred to the Forest Department, the Conservator, Colonel Beddome, was directed to inspect and report upon them. The valuable notes he prepared in June, together with further observations by himself and by Mr. Cross in August, were printed in September, and as the botanical points now in dispute have mainly arisen on the opinions expressed in these documents, it is necessary to give them particular attention. This is especially due to Colonel Beddome, who has a well-merited reputation as a skilful field botanist: as Mr. Cross was the origina. collector of most of the kinds, and familiar with them in the wild state in their native localities, he would also seem to have claims to a hearing.

The principal point insisted on by the latter in his report refers to the hybrid form called "*pubescens*." This, he says, is really a "narrow-leaved variety of red bark" and was called "Pata de Gallinazo" by the bark-collectors in South America. He could not see in it "a particle of the characteristics" of *C. officinalis*, and he observes that the trees may be found at Naduvatam "not unfrequently among the first-planted trees there." He further informed Colonel Beddome that he himself sent *seeds* of this "Pata de Gallinazo" to the Nilgiris at the same time as *succirubra*, but not separate from that species; in a letter to Colonel Beddome, however, dated 10th August 1881,* he gives a very different account of the mode of its introduction, in which he states that he obtained *plants* in the bottom of a ravine on Chimborazo to fill up one of the packages of *succirubra*, and that his companions, two lads, the sons of a bark-collector, identified them at once as Pata de Gallinazo. He also calls it "a new and undescribed species."

All this was absolutely new to everybody; for not a hint of anything of the sort is to be met with in any of the voluminous reports or papers referring to the collection of the Bark-trees for India. Colonel Beddome, however, was quite convinced of the accuracy of Mr. Cross's recollections, and supported his assertions. He, too, could see in the plants none of the characteristics of a hybrid, and considered that they had evidently been in the plantations from their commencement.

Cross afterwards restricted his previous remarks to "*magnifolia*" only, and said that "*pubescens*" was a different species from "Pata de Gallinazo;" after some further consideration, he pronounced that "*pubescens*" was the real *C. succirubra* and that the plant, hitherto grown under that name, was not that species but *C. micrantha*, or some other grey bark! Colonel Beddome, however, could recognize varieties only of a single species in "*magnifolia*" and "*pubescens*," but this, he thought, quite distinct from both *C. succirubra* and *C. officinalis*.

With regard to the supposed numerous varieties of *C. officinalis*, neither Colonel Beddome nor Mr. Cross could trace them out. The former speaks somewhat doubtfully as to the nature of what passes as "*Urituninga*" on Dodabetta, of which he believes there are about 1,000 there and about 12 at Naduvatam. As to *C. Calisaya*, he could distinguish four varieties, ordinary "*Calisaya*," "*Ledgeriana*," "*anglica*" and "*javanica*."

A paragraph (45) is devoted by Colonel Beddome to an "unknown species" with very rough corky bark and leaves hairy on both sides, of which five trees were found on Dodabetta. Mr. Cross at once pronounced this to be "the celebrated *C. crispa* of the Loxa mountains, a packet of the seed of which we collected when collecting the *officinalis*;" he added that it gives a very valuable bark and that he sent the seed to Mr. McIvor who told him that it never germinated.

Mr. Cross sent home thirty samples of bark for analysis by Messrs. Howard. In his remarks upon No. 18 ("Pata de Gallinazo") Mr. J. E. Howard—who also fully accepted Mr. Cross's statements—says † that it is *C. coccinea* of Pavon,‡ and not red bark at all. In abandoning his former view of the hybrid nature of "*pubescens*," Mr. Howard merely says it is one of the "cognate species to *succirubra*."§

Colonel Beddome collected and dried good typical specimens of the 18 different kinds of *Cinchona* he could recognize, and these were forwarded to Kew with the object especially of the "Pata" (No. 2), "pubescens" (No. 3) and the "unknown species" (No. 18) being there identified.

7. *My own views and those of the Kew botanists.*—In September of the same year, I had the pleasure of receiving Colonel Beddome during his short visit to Ceylon. He found on the estates here abundance of Cross's "Pata," and some of the Nilgiri "pubescens." In his report to Government, dated 3rd October (No. 167), by some strange misapprehension, he quoted me as supporting his views as to the nature of these trees. They had, of course, been long familiar to me, but I had always carefully avoided committing myself to a definite opinion about them, though strongly leaning towards the view of their hybrid origin. I therefore found it necessary to state my position, which I did in a letter to the "Ceylon Observer" newspaper, 27th November 1881. I may here be permitted to quote the conclusion of this communication. The name *robusta* which I proposed to adopt was, Colonel Beddome informed me, in

* Enclosure in No. 422. † Enclosure in No. 267, (July 1881).
‡ This was Spruce's determination of the real "Pata" of Chimborazo (see Weddell, "Notes" l.c. page 30).
§ Pharmaceutical Journal, October 1881, page 351.



use on some estates in South India; it is now commonly employed in Ceylon for the trees in question.

"I also desire to say a few words as to the name which this Cinchona should bear. It is, I think, much to be regretted that the name "Pata de Gallinazo" should have been brought out of its obscurity by Mr. Cross and adopted (even provisionally) by Colonel Beddome. This is a mere bark-collector's name and is used in different parts of the Andean chain for at least six different kinds of bark. That which has the best claim to it (as having been first published and more often used) is the best sort of grey bark collected by Pritchett in Huanuco and referred to *C. peruviana* or *C. micrantha*. * * * It is, of course, the case that the name is also used for the "Cascarilla serrana," or Hill Red Bark, which Dr. Spruce* obtained on Chimborazo at 8,500 to 9,000 feet, and with which Mr. Cross (who accompanied Dr. Spruce as gardener) now identifies the plant under discussion. * * * *

"It is to be hoped that the copious dried specimens sent home by Colonel Beddome for comparison with types in the London Herbaria may clear up the matter; but this cannot be very confidently expected. Meanwhile, I would recommend the suppression of the Spanish name of "Pata de Gallinazo" for our "hybrid." If the tree has been duly described and named, we shall, of course, get the proper appellation in time. If not or till then—since the names "pubescens," "magnifolia," "villosa," and others are all, for various reasons, unavailable—we cannot, I think, do better than adopt that already coming into use in Southern India, *robusta*, which is a very appropriate one. By using this, we do not commit ourselves to any views as to the origin of the plant, whether on the plantations of the Nilgiris, or the higher slopes of Chimborazo."

Colonel Beddome's specimens were duly examined by the Kew botanists. Mr. Dyer in his letter upon them (in No. 382, 24th January 1882) agrees that "*magnifolia*" and "*pubescens*" are practically one and the same plant. As to "Pata de Gallinazo," he points out that Mr. Spruce has described this and the closely allied "Cuchicara" in his report (Blue Book I, pages 116, 117), that his specimens are in the Kew herbarium, and that "although there is some resemblance in the foliage it may be said with some certainty that the Nilgiri '*magnifolia*' is not the 'Pata de Gallinazo' of Chimborazo." It is further remarked that Spruce's specimens have been referred by that botanist and by Howard to *C. erythrantha*, Pav., and that "this identification is probably correct;" also that Mr. Triana considers both these specimens and *C. erythrantha*, Pav., as belonging to the species *C. pubescens*, Vahl. It is decided that "the most probable account that can be given of the forms '*pubescens*' and '*magnifolia*' is that they are hybrids between *succirubra* and *officinalis*."

With reference to the "unknown species" (No. 18) no opinion is expressed; as the specimens collected by Mr. Cross were in private hands, no comparison could be made.†

8. *Dr. Bidie's Reports.*—Meanwhile Dr. Bidie had been requested by Government to enquire into Mr. Cross's assertions, and to collect a good series of all the Naduvatam Cinchonas and their barks. In his letter (No. 199), dated 3rd March 1882, he summarily disposes of the notion that any mistake had been made as to the plant known as *C. succirubra*. He also shows that "*pubescens*" is not, as Cross maintained, *C. succirubra*, but suggests that it will probably be found, on comparison, to be "identical with Spruce's pubescent 'Cuchicara' of Llalla," above referred to. As to the "*magnifolia*" Dr. Bidie considers Mr. Cross's identification with "Pata de Gallinazo" "will probably prove correct." For both these opinions his basis is Spruce's brief description above noticed. In a further letter (No. 284), dated 29th March, written after perusal of the remarks of the Kew botanists, Dr. Bidie still supports the above contentions, on the grounds of (*a*) the occurrence of the plants in the oldest plots of the Nilgiri plantations, (*b*) the probability of the truth of Cross's positive statement, (*c*) the improbability of two hybrids so similar to Spruce's two plants arising spontaneously, (*d*) the want of any tendency to depart from type, and (*e*) the fragmentary character of Spruce's specimens (as gathered from his narrative) rendering the comparison possibly fallacious. Sir J. Hooker in reply (letters, dated 13th June, 7th July and 3rd August) can see nothing in these observations to cause him to alter the views previously expressed that "the plant called '*magnifolia*' is not the 'Pata de Gallinazo' collected by Spruce; neither is the plant called '*pubescens*' the 'Cuchicara' of the same traveller."] [The discussion of these questions is continued at page 8 of this Report, paragraphs 19 to 22.]

A collection of well selected and dried specimens of 38 different forms was made by Dr. Bidie (with an accompanying series of the barks from the same trees) and forwarded to Kew where I had the opportunity of examining them in July last.‡ The trees supplying these have been permanently labelled with the same numbers as the barks and specimens, so that they can be readily referred to at any time. The examination of Dr. Bidie's collection led to the following remark by Sir Jos. Hooker in his letter of 3rd August: "Crossing has evidently gone on so extensively that no one but a botanist accustomed to the *facies* of living Cinchona plants could pronounce an opinion upon the mixture of forms with any authority or without the risk of adding to the confusion of nomenclature."

* Colonel Beddome's report (page 8) contains the extraordinary assertion (derived from Mr. Cross?) that Dr. Spruce "could never have seen the trees." But the latter describes their appearance, bark and leaves—the flower and fruit he did not get—in his paper in the "Journal of the Linnean Society," iv., page 185. Indeed, it is Mr. Cross's share in this matter that is the novelty.
† On the identification of this plant see paragraph 16 of this Report.
‡ The dried specimens have been transferred to the herbarium here at Peradeniya. Dr. Bidie has since prepared and transmitted to the Pharmaceutical Society's Museum in London a still larger series, but with the same nomenclature.

I now proceed to the observations I have to make on the botanical characteristics and names of the trees inspected by me in the Nilgiri plantations.

9. *C. succirubra*, Pav.—In regard to Red Bark, I can very confidently endorse the opinions expressed by all the botanists who have examined the matter, that the well-known tree which forms the bulk of Naduvatam is the true *C. succirubra*, Pav. I have examined Pavon's own specimens in the British Museum which precisely correspond with the ordinary Red Bark of India, Ceylon and Jamaica. This has the leaves generally more or less pubescent or puberulent beneath, as is the case with Pavon's specimens; and Mr. Howard is mistaken in saying * that the common plant in India is perfectly smooth. Dr. Spruce's description at p. 104 of his octavo report of 1851 is very good.

I must, however, allow that I found *succirubra* in Naduvatam a more variable type as to foliage than I am accustomed to in Ceylon. Among the large trees in the original plots are to be noticed, besides the ordinary kind with leaves glabrous above and puberulent beneath, not a few which have leaves at least when mature altogether smooth; some again are persistently hairy on both surfaces. There were also a few trees with remarkably narrow leaves attenuated at the base. As a rule, the leaves are less bullate and smaller than in Ceylon, but it must be remembered that Naduvatam is a somewhat higher elevation than this species is usually grown at here. I have no doubt that some of the leaves from the Naduvatam red barks would be called "*pubescens*" in Ceylon, and I am also convinced that this is partly due to many plants and seeds of this kind having been actually sent out from the Naduvatam plantation under the latter name.

A few miserable and scarcely recognizable little trees were all I saw of *succirubra* on Dodabetta.

10. *C. Calisaya*, Wedd.—I have little to say about the plants included under this name represented in the Nilgiris.† There are patches both on Dodabetta and Naduvatam, but neither contain any well-grown trees. As may be seen from the list in paragraph 4, they are of various origins. A plot on the east slope of Dodabetta low down planted in 1865 (said to be from Mr. Money's seed) presents the extraordinary mixture of varieties that one is accustomed to in seed from Java. The bulk are the varieties known as "*javanica*" and "*vera*" in Ceylon, but there are also a few trees of *succirubra* and *micrantha* and two or three of what I am accustomed to consider a hybrid between *Calisaya* and *officinalis* and occasionally met with in Ceylon plantations. Among them, too, the Superintendent, Narrainsawmy, pointed out two or three which he said Mr. Moens, in his visit in 1880, had pronounced to be *C. Ledgeriana*, but these were not in flower, and I am not able to distinguish this species with certainty from foliage alone.

At Naduvatam, as would be expected from its locality, the *Calisaya* varieties are rather better in growth, but even here they are gradually dying out. Dr. Bidie selected no less than fifteen sorts for his dried collection which exhibit a wide range in size and shape of leaf, size and colour of flower and form of the seed-capsule. A large and broad-leaved form is that which grows most vigorously. I saw nothing like *C. Ledgeriana* among them. As might be expected, a fair number of the very broad-leaved large-flowered hybrid with *C. succirubra*, *C. anglica*, How.,‡ were to be seen in Naduvatam.

11. *C. officinalis*, L. (*C. Condaminea*, Humb. & Bonpl.)—Dodabetta plantations are almost entirely composed of this species which grows there to perfection; there are also a large number at Naduvatam. In common with other botanists who have been recently over the plots I failed to detect many marked varieties; indeed what particularly struck me was the remarkable uniformity of type prevailing throughout the vast expanse of Dodabetta; § no greater variety was to be seen than in a plantation of oaks, elms or poplars. If it be desired to distinguish by names the differences in the width of the leaves it would appear that the broadest represent *C. Uritusinga*, Pav., and the narrowest the true *C. crispa*, Taf.; the intermediate ones being the vars. *Bonplandiana*, How., and *angustifolia*, Wedd. I am unable to separate these, which completely pass into one another. I had expected to find here something more distinctive as *Uritusinga*. Two varieties bear the plantation name of "*angustifolia*" and are distinguished as "No. 1" and "No. 2;" the latter has by no means a narrow leaf. One of these represents apparently Mr. Broughton's plant (No. 10 of the list in paragraph 4 ‖) A vigorous propagation was going on by seed of another form, which was called "*crispa*" by McIvor and Beddome, on what grounds I am not aware. This form has rather acuminate leaves and very large flowers, and is remarkable for the development of a very thick corky outer bark. I saw but one plant, but there are said to be seven or eight in Dodabetta. I also detected two plants of *officinalis* (both broad-leaved) distinctly pubescent beneath.

* Pharmaceutical Journal, October 1881. Nor do I think he is correct in stating that bark of "Pata," of "pubescens," or of "Cachicara," is sent home from India or Ceylon under the name of "Red Bark," though, no doubt, *succirubra* bark may have been sent as "hybrid pubescens."

† I notice that in the most recent enumeration of the trees (31st March 1882) no estimate of the number of *Calisaya* is attempted, the space being left blank.

‡ Well figured by Howard in his "Quinology," t. 10. He raised it from seed sent from the Nilgiris by Mr. Broughton and taken from an ordinary *Calisaya* which had doubtless been crossed by neighbouring *succirubra*.

§ McIvor in 1869 says (Report, para. 9) that from the three original kinds of Crown Bark, at least seven distinct varieties had been raised. He is said afterwards to have distinguished as many as twenty-two sorts. Mr. Broughton mentions as many as twenty.

‖ It appears, however, that Broughton's original tree is no longer in existence



12. *C. lancifolia*, Mutis.—Though this has been in cultivation from the very commencement of the plantations, very little has been heard of it; and recently it has quite dropped out of notice, being no longer included in the annual lists. The few existing trees are the survivors of the numerous descendants of a single plant which was alone saved out of six brought from Java in 1861. The two or three that I saw were in the lower part of Dodabetta near the Jalap Garden. I was at first inclined to treat them as another form of *officinalis*, but a closer examination has since shown me their distinctness, if not as a species at least as a well-marked variety. The habit and leaves are certainly very like an ordinary *officinalis*, but the calyx shows a marked contraction above the tube, and its free part is sub-campanulate and spreading with rather large triangular sequents; the disk is very thick and prominent, and the corolla large, dark lake and with a broad tube; the large calyx is persistent and crowns the oblong-ovoid capsule. The different calyx seems to separate it from all forms of *officinalis*.* A figure, reduced from the magnificent plate of Karsten's Columbian Flora, will be found in Markham's "Chinchona Species of New Granada," page 53, where is also reprinted a full description. The cultivation of this species is maintained in the Java Government Plantations.

13. *C. micrantha*, R. & P. *and its allies*.—The Grey Barks require no particular notice here. However important a place they may have once occupied in the plantations, they are now practically extinct.† Isolated specimens can be found on Dodabetta, Naduvatam and Wood plantations, the last survivors of their race. They have died out rapidly: in 1878, close upon 800 trees of *micrantha* were counted on Wood plantation, I saw but one moribund specimen. It is, therefore, unnecessary to make any remarks on their botanical characters; which is somewhat fortunate as these species are very obscure as to their nature and affinities.

14. *C. carabayensis*, Wedd.—(*C. Pahudiana*, How.). Several healthy trees of this pretty but useless species are still growing in the earliest-planted plots at Dodabetta. Its characteristics are quite well known and its interest to Quinologists chiefly historic. Dr. Bidie includes a specimen (No. 36) from Naduvatam in his series.

15. *C. pitayensis*, Wedd.—Of this remarkable species there are some 45 or 50 trees in a clump near "the Jail" at Dodabetta. They are very striking from their habit being so unlike all the other cultivated species; indeed they rather suggest at first a Lauraceous tree or a *Symplocos* than a Cinchona. The species is but little known to botanists, but Howard has given an excellent figure in his "Quinology" t. 12.‡ The branches curve strongly downwards for most of their length and then turn upwards suddenly at their ends; here the leaves are crowded, which are stiff, thick and polished, and stand erect with their pointed ends upwards. The trees were past flowering at the time of my visit, and I was unable to examine the corolla, so remarkable for being hairy within; but the young fruit was characteristic enough, crowned with the presistent long, almost setaceous calyx-segments. I was glad to see that some propagation of this species was being undertaken; it appears to have been singularly neglected. It is true we read in the reports of the late Superintendent of 500 planted out in 1872 at Dodabetta and 400 at Hooker plantation and of no less than 4,386 put out in 1874 at the latter,§ but not one of these, I believe, now exists. The tree affords true Pitayo bark; three different varieties were collected by Mr. Cross, and I noticed among the trees some varying slightly from the rest in having shorter and broader leaves.

16. *C. Humboldtiana*, Lamb.—I was enabled to name Colonel Beddome's unknown species, the "celebrated *C. crispa*" of Mr. Cross (see paragraph 6), from my examination of the material in the London herbaria. The original specimens of this species were collected by Pavon; they are in the British Museum and labelled by him "C. sp. nova de Jaen de Loxa en Quito." The sheets are named by Lambert *C. Humboldtiana*, a name which he published in his "Illustrations of the genus Cinchona" in 1821, where, however, his description does not perfectly agree with his specimens. What I consider to be the same species was also collected by Spruce in August 1856, "in Monte Campana prope Tarapoto, Peruviæ orientalis" and is numbered 4832 in that traveller's extensive series of dried specimens. Though Mr. Cross's determination of it as "*C. crispa*" may be disregarded, yet that he may have collected the seed is evident from the fact that one of the three dried specimens ‖ he brought back with him is this very species. This is ticketed as follows:—"No. 3, *C. species*. In deep ravines on the Sierra de Campana and Koritroche. This species of Cinchona grows on steep banks of ravines in rather moist situations, it is frequently found in the mountains of Samora which lie eastward from Loxa and is sometimes collected by the wild Indians which traverse that tract of country. This tree grows from 50—60 feet in height, Oct. 18, 1861, R.C." It is of this

* True *C. Chahuarguera*, R. & P. (not of Howard, which is merely narrow-leaved *officinalis*), is closely allied or intermediate; and *C. macrocalyx*. Pav. (as figured in Wedd., Hist. Quinq. t. 4 bis., fig. A) must also be very near *C. lancifolia*.

† The plantations were, however, still credited with the possession of 1874 plants on 31st March 1882 (see Report 1881-82).

‡ The figures of *C. corymbosa* and *C. Triana* (both referred to *C. pitayensis* by Triana) as reproduced from Karsten in Markham's "Chinchona Species of New Granada" very little resemble the Dodabetta trees as to foliage.

§ Report for 1873-74, paragraph 3. The plantation books ought to give some details as to the precise plots where these were planted.

‖ These specimens, formerly in the possession of Mr. Markham, were presented by him to Kew Herbarium, February 1882, where I had the pleasure of examining them.

specimen that Mr. Markham writes:* "Bark and leaves of *C. lucumæfolia* of Pavon, from Zamora. This is the 'Cascarilla de hoja de lucma' of the natives." He adds, "Mr. Cross made no attempt to collect the seeds as this species is comparatively worthless;" but be that as it may, the plant has clearly reached the Nilgiris.

Colonel Beddome was by no means the first to notice this at Dodabetta.† Specimens are included in the series made up by Mr. McIvor ‡ for the India Office in 1873 (see Blue Book V., page 91) where they are numbered 24 and called merely "Corky Bark." I have examined them in the British Museum duplicate set.

*C. Mutisii*, Lamb., appears to differ only in the leaves being smooth above, and probably ought to be combined with the present species. To this is to be referred the figure of *C. microphylla* in Howard's "Illustrations," t. 17, fig. 1, which plate is a fair representation of the Dodabetta plant with the exception of the slight difference above mentioned. Howard's plate of *C. villosa* (Ill. t. 6) is referred to *C. Humboldtiana* by Triana (and "*C. villosa*, Pav. MSS." is certainly quoted by Lambert), but cannot represent that species.

This plant is clearly a near ally of *C. carabayensis* (*Pahudiana*) and is probably equally valueless; it differs in its smaller calyx, much less conspicuous in fruit, its less hairy capsule, and its smaller thicker leaves which are rounded at the base instead of tapering, and stiffly hairy above as well as beneath even when fully grown; when dried, their margins are strongly recurved. The large development of cork at Dodabetta is probably an accidental circumstance.

17. *Santa Fè Bark.*—The two surviving plants of this valuable Cinchona are both at Dodabetta, one planted out in the lower part of the North-east side, the other still in a pot in the propagating house. They are now 2½ years old, and that planted out is about three feet high only. The few leaves they possess are peculiar and appear to indicate a species quite unknown to me. The figure (fortunately not coloured) in Howard's "Quinology" t. 14 is a very good representation of them. Both Weddell and Triana place the "Calisaya of Santa Fè" under *C. lancifolia*;§ and, in default of further material for comparison, here it must remain for the present.

18. *Carthagena Bark.*—There are seven plants of this permanently put out at Dodabetta and two at Naduvatam; the latter are the more healthy and the larger is about four feet high. Numerous cuttings are in the propagating houses. There is also a fine plant in Sim's Park at Coonoor.

Of the name of this handsome species I am quite ignorant; it has possibly never yet been defined or named. The leaves of seedlings and young plants are useless for comparisons, being frequently very different from those of adult trees; in these plants they resemble those of *micrantha* more than any other species. The "Hard Carthagena Bark" is usually referred to *C. cordifolia*, Mutis, a variable species with a very wide distribution in South America. Mr. Howard has suggested an affinity with *C. purpurea*, R. & P., which, to judge from the description and his plate (Illustrations t. 11) seems to be probable.

19. *C. robusta.*—In paragraph 5, I have given a sketch of the opinion which prevailed as to the plants I include under the above name, up to the year 1880; and in portions of paragraphs 6, 7 and 8 are detailed the successive views of Mr. Cross, Colonel Beddome, myself, Dr. Bidie, and the Kew authorities. I entered on the examination of the Nilgiri trees with no strongly settled opinion as to their nature, though my Ceylon experience had more and more inclined me to look upon them as hybrid forms rather than as one or more autonomous species.

I found the forms presented to be just those so common in Ceylon plantations. Generally robust well-grown trees, larger, hardier and healthier than either the *officinalis* or *succirubra* among which they were scattered and often flourishing where neither of them can thrive. Botanically, there was the same range of variety, the extreme form in one direction, with its dark green smooth shining leaves, closely approaching some of the large-leafed forms of *C. officinalis*, and that in the other direction with its larger paler thinner leaves more or less pubescent beneath, so close to the hairy form of *C. succirubra* as to be often with difficulty distinguished from it. Between these, as regards color and pubescence, were many intermediates, though undoubtedly, with a little ingenuity, the whole can be thrown into the two groups. There are not many on Dodabetta (where are no *succirubra*), and these are nearly all of the glabrous sort, but on Naduvatam they are much more numerous, and in parts both there and at Hooker plantation they stand out conspicuously above the more or less sickly and stunted kinds round them.

As the chief of the test-points as to origin was the alleged occurrence of a few "in the oldest plots" at Naduvatam, I particularly examined several. They are certainly growing in

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* "Peruvian Bark," p. 238, footnote. I have examined the type specimens of *C. lucumæfolia*, Pav., from Loxa, which is a totally different plant with narrow and perfectly smooth leaves.

† Mr. Howard, in a notice of Colonel Beddome's Report (Pharmaceutical Journal, October 1881, page 354), says the plant should be *C. decurrentifolia*, Pav.

‡ It is doubtless the plant alluded to by Mr. McIvor in his Report for 1869-70 (paragraph 5). "Among our Crown barks we have this year discovered a very interesting and apparently a new species with soft downy leaves and a rough corky bark, but deficient in alkaloid. This plant was raised from the original seeds introduced by Mr. Cross through Mr. Markham, and must have been gathered by accident" (Blue Book V, page 6).

§ I am unable here to refer to Mr. Howard's paper in the Bull. Soc. Bot. France, Vol. XXII, on *C. lancifolia* var. *oblonga*, referring to this plant.



plot No. 1, planted in 1862, and are of both the glabrous and pubescent kinds.* They are also undoubtedly old trees, but that they form really a part of the 1862 *planting* cannot, I think, be affirmed with certainty. From the look alone I do not think it possible to say whether a given tree be twenty years old or sixteen; it is therefore necessary, in the present case, to see whether there are any grounds for supposing that the *robusta* trees may have been supplies put in to fill up vacancies in the original planting. With one tree this appeared to be the case, as it was clearly out of the line, but in two others there was certainly nothing in the surroundings to suggest that they were not part of the same planting as those around them. But the question is of such importance that it requires further examination.

*C. succirubra* first flowered in 1863,† but I have no evidence that *C. officinalis* did so before 1865. In that year, however, both species ripened seed, and in the next the majority of the young plants were being raised from seed.‡ We have it on Mr. McIvor's authority that "in 1866 a number of hybrid seedlings were produced" and that "the selected varieties were planted here and there in every way, soil, exposure, and elevation available."§ In the same year, 1866, six hundred of the original trees, planted out in August and September 1862, were cut down for their bark;‖ and though nothing is said as to the filling up of the gaps thus caused, this was certainly done, as is evident from the regularity of the existing plots. It is most likely to have been effected with the new seedlings; two or three years later, Mr. McIvor expressly states that "all the supplies are plants raised from seed."¶ What therefore more probable than that some of these "hybrid seedlings," which were planted "in every way available," should find their way into the 1862 plantations along with the other supplies in 1866-67.

One of the trees pointed out to me in this 1862 plot was one of those hybrids denounced by Mr. Broughton (31st July 1871) as "combining the bad qualities of both their parents."** Now, he could scarcely have called this tree a hybrid if he had not good grounds for believing that it was no part of the original 1862 plantation in which it grew; indeed he states definitively (13th February 1873) that the hybrids "appear only among seedlings, *there being none among the original trees.*"†† I may add that in this same "1862" plot there are several trees of *Calisaya*, which cannot be any part of the first planting.

A search through the late Superintendent's papers and the plantation records might very probably give much information as to this and other historical matters. He has stated that he always reckoned 30 per cent. of every year's planting as failures to be subsequently filled by supplies, a fact which the recent compilers of statistics of the plots seem to have scarcely fully realized.

These remarks may be considered a sufficient answer to the first of Dr. Bidie's arguments (see para. 8). I will now proceed to discuss the remainder of them.

20. *Mr. Cross' credibility.*—Dr. Bidie thinks Mr. Cross' positive statement that he sent plants of "Pata de Gallinazo" to India to be probably true. To my mind I must say that "probability" points rather the other way. Dr. Bidie has himself remarked on the "little reliance" that can be placed on that traveller's memory, and indeed we have abundant evidence of its treacherous character. It has made him give two different accounts of this very matter, caused him to forget well-known facts and make unfounded statements about Dr. Spruce, hopelessly confused him over the distinctions between *succirubra* and *micrantha*, and supplied him with a totally erroneous name for the plant, "No. 3" of his own collection, now shown to be *C. Humboldtiana*. His reminiscences indeed seem singularly confused, and I do not consider it necessary to further allude to them.

21. *Alleged stability of type.*—Another point urged by Dr. Bidie (*d*) in favor of the autonomous nature of this plant is, as he thinks, the want of a decided tendency, "as in the case of hybrids," to vary more than is usual in other undoubted species of *Cinchona*. I need scarcely remind Dr. Bidie that cultivated plants supply us with abundant examples of known hybrids as permanent as most species; but as regards *C. robusta* our experience in Ceylon is very different. It is notorious that the seed is most uncertain, and it is well known that Mr. McIvor would not trust it. On his visit to Ceylon in 1875-76 he gave seed of his best "*pubescens*" to several careful planters here; the result in one case was 10 per cent. like the parent, and the remainder varieties of *succirubra* and *officinalis*; and this has been the so general experience here that I am indeed surprised to read of a different state of things in the Nilgiris. In Darjiling Dr. King states that "about half" the plants from seed come up "officinalis."‡‡ Colonel Beddome could not deny these facts, but tried to explain them by careless collection of seed, but I know of cases where this source of fallacy was most carefully guarded against with

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* Nos. 2, 3, and 4 of Dr. Bidie's set.

† Kew report for 1863; Journ. Bot., 1863, p. 254.

‡ McIvor, Reports, 1864-65 and 1865-66, para. 4.

§ *Id.*, Report, 2nd August 1875. Mr. McIvor believed these to be the result of his experiments in artificial cross-fertilization; it may be so, but it is perhaps more probable that they arose naturally. In either case they appeared.

‖ McIvor, Report for 1866-67, para. 2. This important fact seems to have been overlooked by subsequent writers.

¶ McIvor, Report, 1869-70.

** This particular tree is a glabrous *robusta* with the leaf more elongated than usual. Colonel Beddome considered it "glabrous *pubescens*."

†† Letter to Howard, printed in his "Quinology," p. 113. The italics are my own.

‡‡ In his Report of the Bengal Cinchona Cultivation for 1881-82 Dr. King distinguishes "six distinct forms" of these *robusta* hybrids.

no difference in the result. Colonel Beddome himself must at the last have had doubts, for he allows that it is better to grow the plant from cuttings.* It is indeed this reversion to apparent parent forms that is one of the chief reasons for regarding *robusta* as a hybrid.

But we have more direct testimony of its origin. I am assured by planters of credit that they have grown both glabrous and pubescent *robusta* from seed of ordinary *officinalis*, and that it is by no means unfrequent for seedlings of them to appear in seed-beds on estates where no trees but *officinalis* and *succirubra* occur. I have myself seen seedlings of *robusta* self-sown where there are no parent trees of the sort whence they could have been derived; and at one time I was inclined to regard it merely as a variety of *officinalis*. There are, I think, grounds for believing that *succirubra* generally supplies the pollen and is therefore the male parent, both in the case of *robusta* (succirubra × officinalis) and *anglica* (succirubra × calisaya). I do not attach any importance to bark-chemistry alone as a botanical character, but it may be noticed, as bearing on the derivation of these trees, that the analyses of their barks (though very variable) combines as a rule the characteristics of both Red and Crown barks.

22. *"Pata de Gallinazo" and "Cuchicara" Barks—C. erythrantha*, Pav.—The two remaining arguments (c and e) dvanced by Dr. Bidie become of less importance in face of what has now been stated. The specimens of "Cuchicara" and "Pata do Gallinazo" collected by Spruce† are no doubt imperfect ones; they have, however, proved sufficient for one of the most careful of botanists, M. Triana, to identify them with *C. erythrantha*, Pav.,‡ to which Messrs. Spruce and Howard had also, with doubt, referred them. The flowers of the more pubescent specimen of the "Cuchicara" are described by Spruce on his ticket as "deep brick red," a tint I have never seen in any Cinchona flower in the East. The leaves of all his three specimens are more or less pubescent. Dr. Bidie rather begs the question when he argues that the fact of the imperfection of these specimens is in favor of the Nilgiri plants being the same, and then proceeds to remark what an "extraordinary coincidence" it would be that two hybrids approaching so closely these wild South American plants should arise in the Nilgiris. It is not admitted that these *robusta* forms *do* approach Spruce's specimens very closely; on the contrary such eminent botanists as Sir J. Hooker, Prof. Oliver, and Mr. Thiselton Dyer express themselves strongly to the contrary effect. The wider tube of the corolla in the "Cuchicara," the color of the flower, and the flat-topped character of the inflorescence are good distinctions from all the forms of *robusta*.§

On a review of the whole question then I am of opinion that the additional evidence derived from an inspection of these forms of Cinchona in the Nilgiri plantations does not by any means prove the improbability—still less the impossibility—of their being, as so long believed, hybrids of local origin between *officinalis* and *succirubra*, which opinion is, on the contrary, supported by a large number of facts of observation and warrantable inference.

23. *Uniformity desirable.*—In conclusion I wish to add a plea for uniformity in nomenclature. It is very much to be desired that the same plants should bear the same names in India and Ceylon and elsewhere, and that obsolete, incorrect, or duplicate names should be abandoned. No less than three different Cinchonas are called *"crispa"* at Dodabetta; it is rightly applied but to one, and that is so ill-defined that the name might well be dropped altogether. The various denominations bestowed on the hybrids may be entirely dispensed with as incorrect or misleading; *magnifolia*, pata, cuchicara, *pubescens*, *villosa*, &c. The glabrous and pubescent forms are now allowed on all hands to be of similar nature, and a single name is sufficient. Those who are convinced of their hybrid character may use the descriptive title *succirubro-officinalis*, or the shorter name *robusta*, whilst those who still think them an autonomous species of South America are bound to call them *C. erythrant'* :. Of course I am not speaking of *barks*; planters and merchants may give these what names they require, *in the vernacular*, but with these names the botanist, as a systematist, has nothing to do.

The only other remark I have to make is to suggest whether the time has not now arrived when the Madras Government might adopt the spelling of this genus of plants followed by scientific men. So far as I am aware, there is not one living botanist who writes it in any other way than *Cinchona*. The matter is a purely technical one; systematists have long ago decided on the rules governing such cases of nomenclature, and the present one is not to be regarded as a subject for discussion. Were it permitted to amend the Latin genera which do not happen to agree precisely in spelling with the names (it may be Russian, Hungarian, or Japanese) of the persons whom they are intended to commemorate, many besides *Cinchona* would have to be altered. But it is not so permitted.

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* Beddome, Report on visit to the Sikkim Plantations.

† It should be remembered that these were collected in 1859, before Dr. Spruce was employed by the Indian Government or Mr. Cross was engaged.

‡ *C. erythrantha* is figured in Howard, Illust. t. 13. It is considered the same as *C. pubescens*, Vahl. by Triana. The descriptions (but not the figures) in the same work of the following are also referred by M. Triana to *C. pubescens*, Vahl.; *C. coccinea*, Hâw.; *C. Palaiba*, How.; *C. suberosa*, Pav.; and *C. suberosa*, Pav.

§ I may add with advantage that in my careful search through the public herbaria of London I did not find any Cinchona from South America agreeing with either of the leading forms of *robusta*



## Part II.—Practical Suggestions.

24. I have now concluded the remarks I have to make with regard to the botany of the Cinchona plantations, the subject upon which I was requested to report. But I have reason to believe that some observations upon the principles which ought, in my opinion, to regulate the future management of this fine State property will be acceptable to the Government. I take it for granted that the recent appointment of Mr. Lawson, of Oxford, to the office of Superintendent is evidence of a desire to maintain the plantations in a high state of efficiency.

25. *Management for past six years.*—It is to be feared that on the whole, during the last few years, the conduct of the estates has not been altogether satisfactory. They have been managed too much with a view to revenue, and without that constant care and oversight which was (at any rate for many years) bestowed by the late Superintendent. I consider that both the plantations and the trees have been overworked. Though many trees which have been frequently barked on Naduvatam and Hooker still appear healthy and cannot be said to have been much hindered in growth, yet, owing to the very imperfect renewal of bark—only in short strips or patches—it is now difficult to get any good samples or to practise the shaving method. I think that very many more trees should have been left untouched; we have yet to learn the effect of removing the bark upon the longevity of the trees and the real life-history of Cinchona in the East. The recent supplies or renewals do not appear to have been very successful, the number of failures being very large.* No vigorous attempts towards increasing the specially valuable sorts or the recent introductions have been made; even the Pitayo barks—obtained at such cost and trouble, and specially recommended in 1878 by Government for further cultivation—remain little more than curiosities, and no effort to propagate the valuable Santa Fè has been made since Mr. Cross' departure.† Selection by cuttings or seed from the best of known analyzed trees (by which system, steadily persisted in, the Dutch in Java have so largely increased the value of their bark) has not been practised, nor is propagation of the delicate sorts by grafting on more hardy varieties carried on. I know from experience that seed has not always been carefully collected, and that there has been a good deal of confusion between *"pubescens"* and *succirubra*.

26. *Necessity for a good propagator.*—Under a new *regime* we may expect to see attention paid to these things as well as to experiments in artificial hybridization‡ and its results, the effects on longevity and health of the processes of stripping and shaving respectively, &c. I venture, however, to suggest that, if the assistance of a skilful propagator be necessary, such an addition to the staff of the Superintendent may be made.

27. *A scientific culture the object for the future.*—Progress in knowledge and improvement in practice, and not gain, should be the main objects of Government in the management of their plantations. I do not forget that the ultimate end of the enterprise is the production of a cheap and efficient febrifuge for India and the East. But this great purpose will be in no way retarded by the course recommended; on the contrary, as all that adds to our knowledge of bark-culture will lead to the increase of private plantations and their successful and profitable culture, it must be forwarded and hastened. The subject is somewhat complicated by various other considerations; but probably the final realization of that grand and beneficent scheme is more likely to be immediately effected by private enterprise in Europe or in India itself than by any Government manufacture of alkaloids. Humanity will be equally benefited in the one case as the other. For the present this subject, however, may be allowed to rest.§ Meanwhile the Government possesses a very valuable property, which, worked without stinting the expenses necessary for the highest experimental cultivation, cannot fail to return a profit for many years to come. More than twenty years ago the Home Government very justly remarked (Despatch, Secretary of State, Jan. 1863) that the Cinchona experiment could not be regarded as a mere money speculation, "nor are the commercial advantages that may be derived from it to be considered as other than a secondary consideration, though of course a return for the outlay and the spread of Cinchona cultivation by private enterprise are very desirable in themselves." How little, when these words were penned, could the present financial success have been imagined, and with how much more force do they now come, when even the outlay itself has been more than repaid, and a large and enterprising class of private growers of bark is in existence.

28. *Necessity of a Quinologist.*—The recent appointment is a step forward, but for any satisfactory progress to be made the chemist as well as the experimental physiologist and botanist is a necessity. For it must be remembered that it is *alkaloids* we want to grow, not bark only, and the cultural Superintendent is likely to be able to give us little accurate information

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* In the three official years 1878—81 no less than 33,407 red barks have died upon Hooker Estate alone (Beddome's Report, Appendix B); and I understand that the mortality of crown barks put in since has reached as much as 80 per cent.

† *C. lancifolia* (paragraph 14) should also be propagated. The latest analyses of this in Java (Moens' Report, 20th February 1883) show total alkaloids varying from 4·6 to 7·2 per cent., of which quinine is from 1·1 to 2·0. Though less valuable than *officinalis*, this species is rather better than the majority of the Java *Calisaya*.

‡ This subject was specially insisted upon in the Report of the Cinchona Commission of 1878.

§ It has been thoroughly discussed in the Report of the Cinchona Commission of 1878, pp. 2—11, and with their opinions on the matter I generally agree.

about them. Further, the chemist must be on the spot, among the trees constantly, and always in readiness to work in unison with the Superintendent as one man at jointly-planned investigations. I desire to press this strongly, as the vast importance of constant analyses does not appear to have been realized by the members of the Commission of 1878, nor at first by Colonel Beddome.*

The Madras Government in supplying this deficiency will, in fact, be merely taking up again the work which was unfortunately dropped some eight years ago on the sudden resignation and disappearance of Mr. Broughton. The value of this chemist's researches is unquestioned, and his results are constantly quoted and acted upon. But his work was left quite unfinished, and it is to be feared that he got but scant assistance from the late Superintendent. He worked, too, a good deal in the dark as to the names and nature of the trees, which were then very unsettled. Since his time this has been changed, and chemists have also given us a great mass of facts as to the chemical composition of the barks of all the cultivated kinds, the main characteristics and general relative value of which in the market are now quite well understood. But there are many questions of the greatest value to cultivators still pressing for solution. The range of difference in the proportions and quantities of the alkaloids in barks from trees of *identical botanical type* is very large, and the same is true of the plants raised from seed of a single tree. We know nothing of the causes of these *individual* differences. There is even variation in analysis of bark raised from cuttings of one and the same tree; yet it has been shown † that the stock has no influence on the alkaloids in grafted shoots. It is thus clear that in the production of alkaloids the inherited nature of the trees is largely influenced by certain surrounding conditions, and these it is most important we should discover. The apparently good results which Mr. Broughton obtained from experimental manuring have never yet been corroborated or disproved. Even the cause of the increase of alkaloids in renewed bark is but little understood, and we probably are unable to avail ourselves of the fact to the full extent. The influence of age on alkaloidal composition in the various species is only guessed at from experience, but no series of analyses of selected trees at frequent intervals from the commencement of their lives onwards is available. These are samples of the investigations which only an analyst resident on the spot and working with the Superintendent can hope to decide.

29. *Position of the Government of Madras.*—All such researches however can only be properly carried on in a Government establishment, where the officers can devote themselves in a spirit of pure research to a work which must, of necessity, be spread over many years. And I will add that it is to the Government of Madras that all who are interested in Cinchona in any of its various aspects necessarily look to take the lead. No other Government, in fact, will be likely to undertake it. In Bengal, the production of febrifuge at present engages the whole attention of the staff, whilst here, in Ceylon, the Government possesses no plantations and is in no position to expend public money without an immediate return. It is true that from Mr. Moens in Java we have learnt much, but even there the object has ever been revenue, and we ought not, and need not, to be dependent upon what a foreign Government may please to make public. On the other hand it was Madras that was formerly in the front position. As the pioneer of Cinchona-growing in India it proved that the best barks could be grown there, and initiated a great industry. This it did as an experiment and with a judicious liberality at immense cost. The excellent system followed has, from fortuitous circumstances, come to an end; under the very favorable present conditions, one cannot but expect to see it revived.

30. *Selection by Analysis.*—To go into any details of cultivation would be out of place here, but I may express the conviction that, in the present state of our knowledge, the most promising direction for the improvement of the trees as alkaloid-yielders is *selection based on analysis*. This is to be effected by the isolation of trees with high analysis, precautions to prevent cross-fertilization, care in collecting seed, analysis of a selection of the resulting plants, destruction of all that do not reach the standard of their parent, again isolation of the best trees, and so on for several generations. The same principle may be more readily applied to grafts and cuttings. It is clear that in such a cultivation it is the chemist who regulates the procedure: plants which his analyses condemn are ruthlessly destroyed, those which answer his test are preserved to become the parents of improved successors.

31. *Changes required.*—The desirability of a plantation at a lower elevation and with a more equable rainfall has been already recognized by Government (G.O., No. 1289, 29th August 1881). Neither *C. Ledgeriana* nor any of the varieties of *C. Calisaya* (of which there is good reason to believe there are some valuable sorts not yet in cultivation) succeed on the existing estates.‡ A site should be selected at about 3,500—4,000 feet in sheltered forest land. In some

* The latter however, after his visit to Ceylon, completely changed his views, and has expressed the opinion that the analyst is "all important." This opinion has been communicated by Government to the Secretary of State (G.O., No. 1313, 13th October 1881).

† Report for first quarter of 1883 of the Java Cinchona Plantations.

‡ The *Calisaya*-forms hitherto introduced make very bad growth and are shot-holed. They are also mostly poor quinine-yielders. Of the fifteen barks of this kind analysed by Dr. Eijkman, only two alkaloid over 3 per cent of that alkaloid (one, No. 14, gave 5·55), whilst one (No. 7) gave only a trace, and all showed a strong tendency to develop the least desirable of the alkaloids—cinchonine (as much as 4·0 in No. 12). Some may be tried at the lower elevation, but experience in Ceylon is not favorable to their cultivation.



estates in such situations in Ceylon *C. Ledgeriana* is doing very well, and has more than equalled the Java trees in alkaloidal yield.

On the other hand the utility of keeping up the Hooker and Wood plantations might be again considered. They have been obviously much neglected, and I see no advantage to be derived from their maintenance beyond the profit from bark sales.

32. *Arrangement of Records and Publication of Results.*—The only other suggestion I have to offer is perhaps scarcely required. It is that all the records, papers, notes, and orders connected with the Government plantations be brought together and properly arranged and classified, so as to be readily available for reference. There must be much in Mr. McIvor's papers supplementary to his rather meagre annual reports, and probably Mr. Broughton's notes would repay perusal. At all events the history of the plantations cannot be followed without ready access to all the records. For the future, Government should take care that accurate note is kept of all work done in the plantation plots (as to deaths, supplies, renewals, and harvesting operations) as well as in the experimental houses and nurseries and in the laboratory. I will conclude by expressing the opinion that all results should be made promptly available to the public in annual reports, which also ought to be easily obtainable.

I have the honor to be
Sir,
Your most obedient servant,

HENRY TRIMEN, M.B.

To the Secretary to Government, Madras.

Royal Botanic Gardens
Peradeniya, Ceylon.
30 June 1883.

Sir,

I have the honour to forward to you my Report on the Cinchona Plantations of the Nilgiris, which I have divided into two portions.

Part I. Botanical Observations.

In accordance with the invitation conveyed to me on 10 April that I would "inspect and report upon the botanical problems presented by the Nilagiri Cinchona plantations", I proceeded, with the sanction of the Government, to Madras, and reached Ootacamund on May 5th. During the succeeding fortnight I investigated the plantations at Dodabetta, Kadivatam and the Pykarah River. Throughout the examination I was so fortunate as to have the company of Dr Bidie who has an intimate knowledge of the plantations

and of my old friend, Mr. Lawson who has lately been appointed Superintendent of them*; at Kadugannawa we were joined by Major Campbell Walker, Cons.r of Forests, Mr. Grass, Deputy Cons. Forests - under whose charge the plantations actually were -, and Mr. Lorn Campbell a member of the Cinchona Committee of 1878.

2. Previous Reputation. In addition to a somewhat critical study of Cinchona, made during my ~~duty~~ connection with the British Museum, & the facilities I have since enjoyed in Ceylon for an acquaintance with the cultivated kinds, I may add that during a visit home last year, I took the opportunity of renewing my acquaintance with the dried collections both at Kew & the British Museum. at the former establishment I paid special attention to the original specimens sent home for the Andes by Spruce & Cross & to Col. Beddome's & Mr. Bidie's recently received series from these plantations; whilst at the Museum I re-examined chiefly the original type-specimens of Pavon and a fine numbered set collected in the Wilagiri plantations themselves

* at the time of my visit, Mr. Lawson had not been actually placed in charge.

by the late Mr. Pritchard in 1873, & presented by the Secy of State for India.

3. Botany of Cinchona in general. So many persons have reported upon the botany of the trees under review, that they possess quite a small literature of their own, & it might be supposed that the subject was thoroughly exhausted. In past times Mr. Markham, the late Mr. Pritchard & especially Mr. Howard, and more recently Col. Beddome, Mr. Cross & Dr Bidie have paid particular attention to the troublesome questions connected with the nomenclature (with regard to some of these writers,) of the several kinds. I trust I am in no way prejudiced of the many & great services that they have rendered to the Cinchona enterprise when I feel bound to say that from the Botanical point of view, I think it is much to be regretted that circumstances should have thrown this very difficult ~~Genus~~ genus into the hands of those who have so little of had of the requisite training & experience in systematic Botany for dealing with it effectively. It ought indeed to be generally understood, that however eminent

a writer may be as a. quinologist, a traveller, a gardener; if he can see important botanical characters in the height of a tree, the chemical constitution of its bark, or the colour of its leaves, he is ipso facto disqualified to pronounce on questions of classification. A number of published names have known been deprived by nothing ~~better~~ more than some such botanically trifling & variable distinctions, & should not be recognized until properly characterized. There is nothing about the genus Cinchona in its botanical aspect ~~— save indeed its endless difficulties —~~ to warrant it being treated on any principles different from those which the systematist is ordinarily accustomed to employ: for authors who know little of those principles & have had no experience in the application of them to other groups of plants, to attempt to arrange the genus of so involved and complicated a genus as this can only lead to failure and confusion.

It may be said that botanists themselves

disagree largely in such points: their differences however appear greater than they really are. There is rarely any serious disagreement as to the relative value of characters, though there is much as to the grade which the individuals or groups depicted by them should occupy. Thus a group which one naturalist will consider as a single species with several varieties will be pass a fine species to another; or a small set of allied species or a single isolated one may be regarded as a distinct genus by one botanist, & be ~~not~~ relegated to some larger one by another. Such differences there must always be, for they represent the more or less synthetical or analytical bent of individual minds, but naturalists have long left off discussions over such matters which indeed since the general acquisition of affinity by descent have lost entirely the significance they once had:

I propose however arrangements of the whole known species of Cinchona - worked out simultaneously but quite independently at the hands of two eminent botanists both familiar with S. America & the

wild trees; the late Mr. Weddell of Paris & Mr. Triana of New Granada*, and it is to these works & especially to that of Mr Triana that we have to go in the endeavour to find sound views as to the limits of the species, (which are nearly all of extreme variability) and their correct nomenclature. Unfortunately in neither treatise are descriptions given; I venture to think that had Mr. Triana attempted to accurately depict his 36 species he would have considerably reduced their number. Too many are still little more than varieties of barks distinguishable by the collectors & by merchants, & do not represent plants with such a combination of anatomical characteristics, as are necessary to constitute a recognizable species.

4. The Kinds in Cultivation in the Nilagiris.

The now well-known story of the successive importation of different sorts of Cinchona from S. America to the Nilagiris is told in official detail in the five Blue-Books (issued from 1863 to 1877) so far as to the middle of 1875, and has been briefly summarized in Major Campbell Walker's excellent report of 1878. It is much

*H.A. Weddell, Notes sur les Quinquinas; in Ann. des Sc. Nat., Botanique, Ser. 5, XI, p. 346, & XII, p. 24. (1869)

J. Triana, Nouvelles Etudes sur les Quinquinas. Paris, 1870 [1872]

to be regretted that the late superintendents' reports are so meagre in detail as to render it impossible, from them, to trace with any certainty the history of the kinds which thus came under his charge. The latest of which I have access is dated 31 July 1875.* It professes to give the botanical names & numbers of the plants of each "species" then cultivated. I need say nothing here about the numbers then given; they have been since shown to be exaggerated to an almost incredible extent; but as to the names, the twelve kinds given were no doubt generally at that time distinguished in the plantations.

1. C. succirubra. Red Bark
2. C. Calisaya
   ——— var. pulex } Yellow Bark.
   ——— var. vera }
3. C. officinalis
   ——— var. Condaminea. Original Loxa Bark
   ——— var. Bonplandiana. Select Crown Bark
   ——— var. crispa. Fine Crown Bark.
4. C. lancifolia. Pitayo Bark
5. C. nitida. Genuine Grey Bark
6. C. species without name. Fine Grey Bark
7. C. micrantha. Grey Bark
8. C. peruviana. Finest Grey Bark.
9. C. Pahudiana.
10. C. lanceolata-leaved variety of C. officinalis.
11. C. Pitayo, raised from imported seed.
12. ——— Plants brought out by D. Empson.

The nomenclature of the first nine kinds

*Blue Book V p 189.

dates from Mr. Nichols's first report, dated 31 May 1862, but some changes had been made since that date. At that time C. officinalis was collectively called "C. calisaya" & the three varieties were respectively "var. Ledgeriana", "var. Chahuarguera" & "var. crispella". No 4 was then said to afford "Crown Bark" (not Pitayo Bark) & no 9 at first went under the name of C. succirubra of the Dutch.

Nos 9 & 10 first appear in the returns for July 1869. No 10 was the tree described by Mr. Broughton in 1868 (the so rich in Quinine, & provisionally called by him * "var. Carabaya" which appears afterwards in 1872 named attached, in accordance with Weddell's nomenclature, to var. angustifolia. No 12, was added in Jan. 1871.

As a correct chronology is important it will be well to give, for easy consultation, the sources & date of reception of these various kinds which composed the plantations of July 1875.

1. C. succirubra. Seeds. S. America. Spruce. Feb 1861.
   Plants. S. America. Cross. April 1861.
2. C. Calisaya. Plants. S. America. Cross. April 1861
   Pe Plants. Java (collected by Hasskarl in 1854 in S. America). V. Anderson. Dec. 1861.

* Blue Book III p 237.

| | | |
|---|---|---|
| 1. C. succirubra. | Seeds. S. America. Spruce. | Feb. 1861 |
| | Plants. S. America. Cross. | April 1861 |
| 2. C. Calisaya. | Plants. S. America. Cross. | April 1861 |
| | Plants. Java (Originally collected in S. America by Hasskarl in 1854). J. Anderson. | Dec[r] 1861 |
| | Seeds. S. America. Markham. | 1865 |
| | Seeds. Hamburg (? including C. Pelleriana) | 1865 |
| | Plants. Kew (Originally from seeds collected in S. America by Weddell). | |
| | "Josephiana, glabra". | 1866. |
| | Plant. J. S. Howard. "Superior variety". | 1867 |
| 3. C. officinalis | Plant. J. S. Howard (from seed collected by Dr Rioffio in S. America). "Uritusinga". | April 1862 |
| | Seeds. S. America. Cross. | Feb & March 1862 |
| 4. C. lancifolia. | Plants. Java. (Seeds originally collected in S. America by Karsten). J. Anderson. | Dec 1861 |
| 5. C. nitida. | Seeds. S. America. Pritchett. | Jan. 1861 |
| 6. C. species without name | | |
| 7. C. micrantha | | |
| 8. C. peruviana | | |
| 9. C. Palmeriana. | Plants. Java (Originally collected in S. America by Hasskarl in 1854) J. Anderson. | Dec 1861 |
| 10. Found among progeny of No 3. | | |
| 11. C. Pitayo. | Seed. S. America. Cross. | 1869 |
| 12. — | Plants. Brought by Dr. Simpson for England. | Dec 1870. |

Since the date of this Report the principal new sorts that have been brought into the plantations are the new Granadan (Columbian) Bark-trees. Mr. Cross arrived at Ootacamund on 8 October 1860 with 3 plants of Santa Fè (Soft Columbian) and 6 of Carthagena (Hard Columbian) which he had himself collected

in S. America. Probably seeds or plants of C. Ledgeriana for ~~the~~ the Govt. plantations in Java were also received in 1872 -1875 a theretabout, but I find no record of their ~~reception~~ receipt. Quite recently, in March 1883, seed of varieties of Calisaya stated to be the "verde" & "morada" of Bolivia have been purchased from a London firm and numerous seedlings have been raised.

5. The Hybrids; "pubescens" & "magnifolia". Mr. Mc Ivor died in June 1876, and up to the arrival of Mr. Cross as above noted, the names in the list given in the last paragraph were generally recognized & used. In addition however to these, the two names at the head of this paragraph were also commonly employed to designate trees which it was believed resulted from the crossing of C. officinalis & C. succirubra. These were first brought prominently into notice by Mr. Broughton in 1869*; Mr. McIvor in his report for 1869-70, also remarks on the readiness with which hybridization occurs, & states that some "very interesting hybrid varieties" had been raised from seed. The name "pubescens" dates from 1872 when it was bestowed as a varietal (hybrid) name by Mr Howard † on a plant, the bark of

* Blue Book III, 239; V, 48, & Journ. Linn. Soc., XI, 475. † Journ. Linn. Soc. XIV. 160.

which afforded him a very high percentage of alkaloids.
that of "magnifolia" seems to have arisen from a
faulty identification of the leaves with the plate
of C. magnifolia, Pav. in Howard's "Illustrations"*
by Mr. Mc Ivor. The hybrid nature of these plants
remained
~~was~~ unquestioned, and their rapid increase
led Mr. Howard to write in 1876†, "it seems
difficult now to obtain seed for Ootacamund
that is not hybridized" Dr. Bidie also in
1878‡ was much struck with the strong tendency of
the species to cross, and says of the "hybrid called
C. pubescens" that "Specimens submitted to Dr. King
& myself .... show that it is a hybrid with a
strong strain of the Officinalis family, & apparently
a cross between C. Officinalis & C. succirubra".

Similar experience was recorded as early as
1870 for Sikkim, Ceylon & Java, and up to
the end of 1880 there was a general consensus
of opinion as to the probable origin of the plants.

6. Mr. Cross's & Col. Beddome's opinions —
In January 1881 Mr. Cross sent in a report
on the plantations, which was printed in the
following June. Early in the same year, the
plantations having been transferred to
the Forest Department, the Conservator, Col.

* Tab. 13. This represents a native of a different genus, Cascarilla,
now Cascarilla magnifolia, Weddl.
† Dictionl. Ind. Plants., p. 84. ‡ Appendix to Rep. of Finch. Committee
1871. 42-45.

Beddome was directed to inspect and 49
report upon them. He valuable notes he prepared
in June,
together with further observations of himself & by
Mr. Cross in August
Mr. Cross printed in September, and as
the botanical points in dispute have mainly
arisen on the opinions expressed in these documents
it is necessary to give them particular attention.
This is especially due to Col. Beddome who has
a well-merited reputation as a skilful
field-botanist: as Mr. Cross was the
original collector of most of the kinds, &
& familiar with them in the wild state in their
native localities, he would also seem to have
claims to a hearing.

The principal point insisted on by the
latter in his Report refers to the hybrid form
called "pubescens" This he says really is a name-
less variety of red bark" & was called
"Peta de Gallinazo" by the bark collectors in S.
America. He could not see in it "a particle of
the characteristics" of C. officinalis, and he
observes that the trees may be found at
Nedivattam "not unfrequently among the first
planted trees there". He further informed
Col. Beddome that he himself sent seeds of
this "Peta de Gallinazo" to the Nilgiris at the same
time as succirubra but not separate for that
species; this letter, Mr. Cross, dated 10 Aug 1881,* he
gives a very different account of the mode

* Enclosure in Vol. 422

51

of its introduction, ~~explosion~~ in which he states that he obtained plants in the bottom of a ravine or chinbraga to fill up one of the packages of succirubra, & that his companions, two lads the sons of a bark-collector, identified them at once as Pata de Gallinazo. He also calls it "a new & undescribed species."

All this was absolutely new to everybody: not a hint of anything of the sort is to be met with in any of the volumes of this Reports or papers refering to the collection of the Bark-trees for India: Col. Beddome however was quite convinced of the accuracy of Mr. Cross's recollections, & supported his assertions. He could see in the plants some of the characteristics of a hybrid, & considered that they had evidently been in the plantations for their commencement.

Cross afterwards restricted his previous remarks to "magnifolia" only, & said that "pubescens" was a different species from "Pata de Gallinazo"; after some further consideration he pronounced that "pubescens" was the real C. succirubra & that the plant hitherto grown under that name was not that species but C. micrantha or some other grey bark! Col. Beddome however recognized varieties of a single species only in "magnifolia" & "pubescens", & this he thought quite distinct from both C. succirubra & C. officinalis.

Remarks accompanying No 10 [Pata de gallinaza]

* On this plant see Par 16. of this Report

With regard to the supposed numerous varieties of C. officinalis written Col. Beddome nor Mr. Cross could trace them out. The former speaks somewhat doubtfully as to the nature of what passes as "Nieluroniya" in Dodabetta, of which he believes there are about 1000 there & about 12 at Nadivatam. As to C. Calisaya he could distinguish four varieties, adding "Calisaya", "Ledgeriana", "angfica" & "javanica".

A paragraph (45) is devoted by Col. Beddome to an "unknown species" with very rough corky bark & leaves having on both sides of which 5 trees were found on Dodabetta. Mr. Cross at once pronounced this to be "the celebrated C. crispa of the Loxa mountains, a packet of the seed of which we collected when collecting the officinalis"; he added that it gives a very valuable bark & that he sent the seed to Mr. Lechler who told him that it never germinated.*

Mr. Cross sent home 30 samples of bark for analysis by Messrs Howard. In his remarks accompanying no. 18 ("Patia de Gallinazo")

* On this plant see Par. 16. of this Report

Mr. J. E. Howard – who also seem to have fully accepted Mr. Cross's statements – says* that it is C. coccinea of Pavon† & not red bark at all. In abandoning his former view of the hybrid nature of "pubescens", Mr. Howard merely says it is one of the "cognate species to succirubra"

Col. Beddome collected and dried good typical specimen of the 18 different kinds of Cinchona he cd recognise, & these were forwarded to Kew with the object especially of the "Pata" (no 2), "pubescens" (no 3) and the "unknown species" (no 18) being there identified.

7. My own views & those of the Kew botanists.

In September of the same year I had the pleasure of receiving Col. Beddome during his short visit to Ceylon. He found on the Estates here abundance of Cross's "Pata", & some of the hybrid "pubescens". In his Report to Govt. dated 3 October (no 167) by some strange mis-apprehension he quoted me as supporting his views as to the nature of these trees. They had of course been long familiar to me, but I had always carefully avoided committing myself to a definite opinion about them, though strongly leaning towards the view of their hybrid origin.

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* Pharmac. Journ. Oct 1881, p 351. I have not the original Report. † This was Spruce's determination of the real "Pata" of Chimborazo (see Weddell, "Notes" l. c. p 30)

I therefore found it necessary to state my position, which I did in a letter to the "Ceylon Observer" newspaper, 27 November 1881. I may here be permitted to quote the conclusion of this communication. The name robusta which I here proposed to adopt was, Col. Beddome informed me, in use on some estates in S. India; it is now commonly employed in Ceylon for the trees in question.

"I also desire to say a few words as to the name which this cinchona should bear. It is I think much to be regretted that the name "Pata de Gallinazo" should have been brought out of its obscurity by Mr. Cross and adopted (even provisionally) by Col. Beddome. This is a mere bark-collector's name and is used in different parts of the Andean chain for at least 6 different kinds of bark. That which has the best claim to it (as having been first published and more often used) is the best sort of grey bark collected by Pritchett in Huanuco and referred to *C. peruviana* or *C. micrantha* — this "Pata de Gallinazo" was

** It is, of course, the case that the name is also used for the "Cascarilla serrana" or Hill red bark, which Dr. Spruce obtained on Chimborazo at 8,500 to 9,000 feet, and with which Mr. Cross (who accompanied Dr. Spruce as gardener) now identifies the plant under discussion.†

*** ~~Let~~ It is to be hoped that the copious dried specimens sent home by Col. Beddome for comparison with types in the London Herbaria may clear up the matter; but this cannot be very confidently expected. Meanwhile, I would recommend the suppression of the Spanish name of "Pata de Gallinazo" for our "hybrid." If the tree has been duly described and named we shall, of course, give the proper appellation in time. If not or till then—since the names "pubescens," "magnifolia," "villosa," and others are all for various reasons unavailable—we cannot, I think do better than adopt that already coming into use in Southern India, *robusta*, which is a very appropriate one. By using this, we do not commit ourselves to any views as to the origin of the plant, whether on the plantations of the Nilgiris, or the higher slopes of Chimborazo."

† Col. Beddome's report (p. 8.) contains the extraordinary assertion (derived from Mr. Cross?) that Dr. Spruce "could never have seen the trees." But the latter describes their appearance, bark and leaves—the flower and fruit he did not get—in his paper in the "Journal of the Linnean Society" iv. p. 185. Indeed, it is Mr. Cross's share in this matter that is the novelty. "

et/
al/

Col. Beddome's specimens were duly examined by the Kew botanists. Mr. Dyer in his letter upon the "magnifolia" & "pubescens" (24 Jan 1882) agrees that ~~they~~ are practically one & the same plant. As to "Pata de Gallinazo", he points out that Mr. Spruce has described this & the closely allied "Cinchona" in (Flora Book I pp 116, 117), which (this report) that his

Specimens are in the Kew herbarium, & that "although there is some resemblance in the foliage it may be said with some certainty that the Wilgiri "magnifolia" is not the "pata de Gallinazo" of Cinchonazo" He further remarked that Spruce's specimens have been referred by that botanist & by Howard to C. erythrantha, Pav. and that "this identification is probably correct"; also that Mr Triana considers both these specimens & C. erythrantha, Pav. as belonging to the species of C. pubescens, Vahl. It is decided that "the most probable account that can be given of the forms "pubescens" & "magnifolia" is that they are hybrids between succirubra & officinalis"

With reference to the "unknown species" (no 18) no opinion is expressed; as the species collected by Mr. Cross were in private hands no comparison could be made.*

8. Dr. Bidie's Reports. Meanwhile Dr. Bidie had been requested by Government to enquire into Mr. Cross's assertions, and to collect a good series of all the Nadavattam Cinchonas & other barks. In his letter (no 199) dated 3 March 1882 he summarily disposes of the notion that any mistake had been made as to the plant known as C. succirubra. He shows that "pubescens" is not, as Cross maintained, C. succirubra, but suggests that it will probably be found on

* As to identification of this plant see Par. 16 of this Report

comparison to be "identical with Spruce's
[illegible] "Cuchicana of Klotzsch", above referred
to. as to the "~~Foetens~~ magnifolia" D. Bidie considers
Mr. Cross's identification with "Pata de Gallinazo"
"will probably prove correct" For both these opinions
his basis is Spruce's brief description above
~~referred to~~ noticed. In a further letter (no 284)
dated 29 March, written after perusal of
the remarks of the Kew botanists, D. Bidie
still supports the above contentions, on the
grounds (a.) of the occurrence of the plant in the
oldest plots of the Nilgiri plantations, (b.) the
probability of the truth of Cross's positive
statement, (c.) the improbability of two hybrids
so similar & Spruce's two plants arising
spontaneously, (d.) want of a tendency to depart from ~~their~~ [illegible] type, & (e.) the
fragmentary character of Spruce's specimens
(no ~~#~~ gathered from ~~the~~ his narration) rendering the
comparison possibly fallacious. Sir J.
Hooker in reply (letters dated 13 June, 7 July &
3 August) can see nothing in these observations
to cause him to alter the views previously
expressed that "the plant called "magnifolia"
is not the "Pata de Gallinazo" collected by
Spruce; neither is the plant called "pubescens"
the "Cuchicana" of the same traveller" *

A collection of ~~#~~ well selected & dried
specimens of 38 different forms was made

* Pp 19–22 of this Report continue the discussion of these questions.

by D. Ridle (with an accompanying series of the barks from the same trees) and forwarded to Kew where I had the opportunity of examining them in July last. The trees supplying these were permanently labelled with the same numbers as the barks & specimens, so that they can be readily referred to at any time. The examination of D. Ridle's collection led to the following remark by Sir Jos. Hooker in his letter of 3 August "Crossing has evidently gone on so extensively that no one but a botanist accustomed to the *facies* of living Cinchona plants could pronounce an opinion upon the mixture of forms with any authority or without the risk of adding to the confusion of nomenclature"

~~(Par. 19, C. 22 of this Report outlines the solution of this question)~~

9. C. succirubra, Pav. I now proceed to the observations I have to make on the botanical characteristics & names of the trees inspected by me in the Nilagiri Plantations.

In regard to Red Bark, I can very confidently endorse the opinions expressed by all the botanists who have examined the matter, that the well-known tree which gives the bulk of Madrastam is the true C. succirubra, Pav. I have examined Pavon's own specimen

* The dried specimens have since been transferred to the herbarium here at Peradeniya. D. Ridle has since prepared & transmitted to the Pharmaceutical Society's Museum in London, a still larger series, but with the same nomenclature

in the British Museum which precisely corresponds with the ordinary Red Bark of Nilgiri & Ceylon & Jamaica. This has the leaves generally more or less pubescent or pubescent beneath, as is the case with Pavon's specimens; and Mr. Howard is mistaken in saying* that the common plant in India is perfectly smooth. Dr Spruce's description at p 104 of his octavo report of 1861 is very good.

I must however allow that I found succirubra in Nadiwatam a more variable as to foliage type than I am accustomed to in Ceylon: among the large trees in the original plots are to be noticed, besides the ordinary kind with leaves glabrous above & pubescent beneath, not a few which at least when mature have leaves altogether smooth; some again are persistently hairy on both surfaces. There were also a few trees with remarkably narrow leaves attenuated at the base. As a rule the leaves are less bullate & smaller than in Ceylon, but it must be remembered that Nadiwatam is a somewhat higher elevation than this species is usually grown at here. I have no doubt that

* Pharmac. Journ Oct 1881. How do I think he is correct in stating that bark of "Pata", of "pubescens", is often imported from India & Ceylon under the name of "Red Bark" though succirubra bark may have been sent as "hybrid pubescens"

tone of the leaves from the Hakgalla red tinge would be called "pubescens" in Ceylon, & I am also convinced that this is partly due to many plants & seeds of this kind having been actually sent out from this plantation under the latter name.

a few miserable & scarcely recognizable little trees were all I saw of succirubra in Hakgalla.

10. C. Calisaya, Wedd. I have little to say about the plants included under this name represented in the Kalapies.* There are pubescens both in Hakgalla & Nadunatam, but neither contain any well-grown trees. as may be seen from the list in P. 4, they are of various origins. a plot on the east slope of Hakgalla has been planted in 1865 (said to be from Mr. Money's seed) present the extraordinary mixture of varieties that are is accustomed to. The bulk are the varieties known as "javanica" & "vera" in Ceylon, but there are also a few trees of succirubra and micrantha and two or three of what I am accustomed to consider a "hybrid between Calisaya & officinalis occasionally met with in Ceylon plantations. Among them, too, the superintendent, Nanamisamy, pointed out two or three which he said Mr. Moyes, in his visit

* I notice that in the most recent enumeration of the trees (31 March 1882) no estimate of the number of Calisaya is attempted, the space being left blank.

in 1880, had pronounced to be C. Ledgeriana, but these were not in flower, and I am not able to distinguish this species with certainty from foliage alone.

At Nadavatam, as would be expected from its locality, the Calisaya varieties are rather better in growth, but even here they are gradually dying out. D. Bidie selected no less than 15 sorts for his dried collection which exhibit a wide range in size & shape of leaf, & colour of flower & form of the seed-capsule. A large & broad-leafed form is that which grows most vigorously. I saw nothing like C. Ledgeriana among them. As might be expected, a fair number of the very broad-leafed large-flowered hybrid with C. succirubra, ~~and the red~~, C. anglica, How.*, were to be seen in Nadavatam.

11. C. Officinalis, L. (C. condaminea, Humb. & Bonpl.)

Dodabetta plantations are almost entirely composed of this species which grows there to perfection; there are also a large number at Nadavatam. In common with other botanists who have recently been over the plots I failed to detect many marked varieties; indeed what particularly struck me was the remarkable uniformity of type prevailing throughout the vast expanse

* well figured by Howard in his "Quinology" t. 10. He raised it from seed sent from the Nilgiris by Mr. Broughton & taken from an ordinary Calisaya which had doubtless been crossed by neighbouring succirubras

of Dodebetta*; ~~containing~~ no greater variety prevailed than in a plantation of oaks or elms or poplars.

If it be desired to distinguish by names the differences in the width of the leaves it would appear that the broadest ones represent C. Ukhtuviga, Pan. and the narrowest the true C. crispa, Jaf.; the intermediate ones being the vars. Bonplandiana, Hoo. & angustifolia, Wedd.

I am unable to separate these, which completely pass into one another. I had expected to find here something more ~~exact~~ distinctive as Ukhtuviga. Two varieties bear the plantation name of "angustifolia" and are distinguished as "No. 1" & "No. 2"; the latter has by no means a narrow leaf. One of these represents apparently Mr. Broughton's plant, (No 10. of the list in Par. 4)† a vigorous propagation was going on by seed of another form, which was called "crispa" by Mr Voir & Beddome, on what grounds I have no idea. This pair has rather acuminate leaves & very large flowers; it is remarkable for the development of a very thick corky outer bark. I saw but one plant, but these are said to be rare in Dodabetta. I also

† It appears however that Broughton's original tree is no longer in existence.

* Mr Cleghorn in 1869 says (Report. par. 9) that on the three original kinds of Cinnamon Bark at least 7 distinct varieties had been raised. These are said afterwards to have distinguished as many as 22 sorts; Mr. Broughton mentions as many as twenty.

detected two plants of officinalis (both broad-leaved) distinctly pubescent beneath.

12. C. lancifolia, Mutis. Though this has been in cultivation from the very commencement of the plantations, very little has been heard of it; & recently it has quite dropped out of notice & being no longer included in the annual lists. The few existing trees are the miserable survivors of the 5 descendants of a single plant which was all that was saved out of six brought from Java in 1861. The two or three that I saw were in the lower part of Dodabetta near the Jalap Garden. I was at first inclined to treat them as another form of officinalis, but a closer examination has since shown me their distinctness, if not as a species at least as a well-marked variety. The habit and leaves are certainly very like an ordinary officinalis, but the calyx shows a marked contraction above the tube, & its free part is sub-campanulate and spreading with rather large triangular segments; the disk is very thick & prominent, & the corolla large, dark lake & with a broad tube; the large calyx is persistent and crowns the oblong-ovoid capsule. The calyx seems to separate it from all forms of officinalis.* A figure, reduced from the magnificent

* True C. Chahuarguera, R & P. (not of Howard, which is merely narrow-leaved officinalis) is doubtless a intermediate; & C. macrocalyx, Pav (as figured in Wedd. Hist. Quina t. 4 bis, fig. A) must also be very near C. lancifolia.

pls plate of Karsten's Columbian Flora will be found in Markham's "Cinchona Species of New Granada" reprinted p 83. where is also a full description. The cultivation of this species is maintained in the Java Govt. Plantations.

13. C. micrantha, R. & P. & its allies.

The Grey Barks require no particular notice here. However important a place they may have once occupied in the plantations, they are now practically extinct.* Isolated specimens can be found in Dodabetta, Naduvattam & Wood plantations, the last survivors of their race. They have died out rapidly: in 1878 close upon 800 trees of micrantha were counted on Wood plantation, I saw but one moribund specimen. It is therefore unnecessary to make any remarks on their botanical characters; which is somewhat fortunate as these species are very obscure as to their nature & affinities.

14. C. carabayensis, Wedd (C. Pahudiana, Howard) Several healthy trees of this pretty but useless species are still growing in the earliest-planted plots at Dodabetta

*The plantations were however still credited with the possession of 1874 plants on 31 March 1882 (see Report 1881-82)

Its characteristics are quite well known & its interest to Quinologists chiefly historic. H. Bridie includes a species (No 36) from Maduvattan in his series.

15. C. pitayensis, Wedd. Of this remarkable species there are some 45 or 50 trees in a clump near "the jail" at Dodabetta. They are very striking for their habit being so unlike all the other cultivated ~~Cinchonas~~ species; indeed they rather suggest at first a Lauraceous tree or a Symplocos than a Cinchona. The species is but little known to botanists, but Howard has given an excellent figure in his "Quinology" t. 12*

The branches curve strongly downwards for most of their length & then turn upwards suddenly at their ends; here the leaves are crowded, which are stiff, thick & polished, & stand erect with their pointed ends upwards. The trees were just flowering at the time of my visit & I was unable to examine the corolla so remarkable for being hairy within; but the young fruit was characteristic enough, crowned with the persistent long, almost setaceous calyx-segments.

* The figures of C. corymbosa & C. Triana (with reference to C. pitayensis by Triana) as reproduced for Karsten in Markham's "Cinch. Species of N. Granada" very little resemble the Dodabetta trees as to foliage.

I was glad to see that some propagation of this species was being undertaken; it appears to have been singularly neglected. This tree we read in the reports of the late Superintendent of 500 planted out in 1872 at Dorabetta, & 400 at Hooker plantation & of no less than 4,386 ~~plants~~ put out in 1874 at the latter*, but not one of these, I believe, now exists. The tree affords the Pitaya bark; three different varieties were collected by Mr. Cross, & I noticed among the trees some varying slightly from the rest in having shorter & broader leaves.

16. C. Humboldtiana, Lamb. I was enabled to name Col. Beddome's unknown species, the "celebrated C. crispa" of Mr. Cross (see P 6), from my examination of the material in the London Herbaria. The original specimens of this species were collected by Pavon; they are in the British Museum and labelled by him "C. sp. nova de Jaen de Loxa en Quito". The sheets are named by Lambert C. Humboldtiana a name which he published in his Illustr. of the ~~[illegible]~~ when known his description does not perfectly agree with his specimen. genus Cinchona in 1821. (What I consider to be the same species was also collected by

* Report for 1873-4, par 3. The plantation books ought to give some details as to the precise plots where these were planted.

Spruce in August 1856 "prope montes Campana prope Tarapoto, Peruviae orientalis" & is numbered 4832 in that traveller's extensive series of dried specimens. Though Mr. Cross's determination of it as "C. crispa" may be disregarded, yet that he may have collected the seed is evident from the fact that one of the three dried specimens* he brought back with him is this very species. This is ticketed as follows:— "No 3. C. species. In deep ravines on the Sierra de Campana and Koritoche. This species of Cinchona grows on steep banks of ravines in rather moist situations, it is frequently found in the mountains of Samora which lie eastward from Loxa & is sometimes collected by the wild Indians which traverse that tract of country. This tree grows from 50 – 60 feet in height. Oct. 18, 1861. R. C."

Of this specimen, Mr. Markham writes †"Bark and leaves of C. lucumaefolia of Pavon, from Zamora. This is the "Cascarilla de hoja de lucma" of the natives" He adds, "Mr. Cross made no attempt to collect

*These specimens, formerly in the possession of Mr. Markham, were presented by him to Kew Herbarium, Feb 1882, when I had the pleasure of examining them.

†"Peruvian Bark", p. 238, footnote. I have examined the type specimens of C. lucumaefolia, Pav. from Loxa; which is a totally different plant with narrow & perfectly smooth leaves.

the seeds as this species is comparatively worthless;" but be that as it may, the plant has clearly reached the Nilgiris.

Col. Beddome was by no means the first to notice this at Dodabetta.* Specimens are included in the series made up by Mr. McIvor † for the India Office in 1873 (see Blue Bk V. p. 91) where they are numbered 24 and called merely "Corky Bark". I have examined them in the British Museum duplicate set.

C. lancifolia, Lamb. appears to differ only in the leaves being smooth above, & probably ought to be combined with the present species. To this is to be referred the C. microphylla figured in Howard's "Illustrations" t 17 fig 1, which plate is a fair representation of the Dodabetta plant with the exception of the slight difference above mentioned. Howard's plate of C. nitida (Ill. t.6) is referred to C. Humboldtiana by Triana (a "C. nitida Pav. Kth." is certainly quoted by Lambert) but cannot represent that species.

This plant is clearly a near ally of

* Mr. Howard, in a notice of Col. Beddome's report (Pharmac. Journ. oct 1881, p. 354), says the plant should be C. decurrentifolia, Pav.

† It is probably also the plant alluded to by Mr. McIvor in his Report for 1869-70 (par. 5) "Among our Cross Books we have this year discovered a very interesting & apparently a new species with soft downy leaves & a rough corky bark, but deficient in alkaloid. This plant was raised from the original seeds introduced by Mr. Cross through Mr. Markham & must have been gathered by accident" (Blue Bk. V. p. 6)

and is probably equally valueless: 30

of C. carabayensis (C. Palumbiana) ~~from which~~
it differs in its smaller calyx much less
conspicuous in fruit, its less hairy capsule,
& its smaller thicker leaves which are rounded
at the base instead of tapering, & stiffly hairy
above as well as beneath even when fully grown;
when dried their margins are strongly recurved.
The large development of cork on the bark
is probably an accidental circumstance.

17. Santa Fé Bark — The two surviving
plants of this valuable Cinchona are both at
Frodsbetta; one planted out in the lower
part of the North-east side, the other still in
a pot in the propagating house. They are
now 2½ years old, & that planted out is
about 3 ft. high only. The few leaves they
possess are peculiar & appear to indicate
a species quite unknown to me. The figure
(fortunately not coloured) in Howard's "Quinology"
t. 14 is a very good representation of them *
Both Weddell & Triana place the "Calisaya
of Santa Fé" under C. lancifolia *; and, in
default of further material for comparison,
here it must remain for the present

* I am unable here to refer to Mr. Howard's paper in the
Bull. Soc. Bot. France vol XXII as C. lancifolia was alone
referring to this plant.

18. Carthagena Bark — There are seven plants of this permanently put out at Doddabetta and two at Nadoutam; the latter are two more healthy & the larger is about 4 ft. high. Numerous cuttings are in the propagating houses. There is also a fine plant in Lewis Park at Coonoor.

Of the name of this handsome species I am quite ignorant; it has probably never yet been described & named. The leaves of seedlings & young plants are useless for ~~such~~ comparisons being frequently very different from those of adult trees; in these plants they resemble those of micrantha more than any other species. The "Hard Carthagena Bark" is usually referred to C. cordifolia, Mutis, a variable species with a very wide distribution in S. America. Mr. Howard has suggested an affinity with C. purpurea, R. & P., which to judge from the description & his plate (Illustrations t 11) seems to be ~~very~~ probable.

19. C. robusta - In paragraph 5 I have given a sketch of the opinion which prevailed as to the plants I include under the above name, up to the year 1880; and in portions of par. 6, 7 & 8 are detailed the successive views of Mr. Cross, Col Beddome, D. Bidie, myself & the Kew authorities. I entered on the examination of the Wilgiri trees with no strongly settled opinion as to their origin, although my Ceylon experience had more and more inclined me to look upon them as hybrid forms rather than as one or more autonomous species.

I found the forms presented to be quite those so common in Ceylon plantations. Generally robust well-grown trees, larger, hardier and healthier than either the officinalis or succirubra among which they were scattered & the flourishing where neither of them can thrive. Botanically there was just the same range of variety, the extreme form in one direction, with its dark green & wide shining leaves, closely approaching some of the large-leafed forms of C. officinalis, & from the other direction, with its large pale thinner leaves more or less pubescent

beneath, so close to the hairy form of
C. succirubra as to be often with difficulty
distinguished from it. Between these as regards
colour & pubescence were many intermediate,
though undoubtedly with a little ingenuity
the whole can be thrown into the two groups.
There are not many in Doddabetta (where are
no succirubra) and these are nearly all of the
glabrous sort, but on Naddavatam they
are much more numerous & in parts both
there & at Korker plantation they stand
out conspicuously above the more or less
sickly & stunted kinds round them.

As the chief of the test-points as to origin,
was the alleged occurrence of a few "in the
oldest plots" at Naduvatam. I particularly
examined several. They are certainly
growing in the plot marked No 1, planted in 1862;
and are of both the glabrous & pubescent kinds.*
They are also undoubtedly old trees; but that they
are really a part of the 1862 planting
cannot, I think, be affirmed with certainty.
From the bark alone I do not think it possible
to say whether a pine tree be 20 years old or
16; it is therefore necessary in the present case
to see whether there are any grounds for
supposing, that the succirubra trees may have

* Nos 2, 3, 4, & 5 D. Nilgiri set.

bee supplies put in to fill up vacancies
in the original planting. Altho one tree does
appeared to be the case, as it was clearly out
of the line, but in two others there was
certainly nothing in the surroundings to support
that they were not part of the same planting
as those around them. The question is of
such importance that it requires further
examination.

C. succiabra first flowered in 1863*; but
I have no evidence that C. officinalis did so
before 1865. In that year however both trees
ripened seed†, and we learn at the Archives
authority that "in 1866 a number of hybrid
seedlings were produced" & that "the selected
varieties were planted here and there, in every
way, soil, exposure & elevation available"‡
In that year 1866 six hundred of the best plants,
planted out in august & september 1862, were cut
down for their bark§; and though nothing
is said as to the filling up of the gaps thus
caused, this was certainly done, as is evident
from the regularity of the existing plots. It is
very likely to have been effected with the new
seedlings; two a three years later, Mr Mc Ivor

§ Mc Ivor, Report for 1866-67, par 2. This important fact seems to have been overlooked by subsequent writers.
* Kew Report for 1863; Journ. Bot. 1863 p 254.
† Mc Ivor, Reports 1864-5, & 1865-6, par. 4.
‡ Id., Report 2nd aug. 1875. Mr. Mc Ivor believed 'there to be the result of his experiments in artificial cross-fertilization; it may be so, but it is perhaps more probable that they arose naturally. In either case they appeared.

expressly states that "all the supplies are plants raised from seed".* What therefore more probable than that some of these "hybrid seedlings", which were planted "in every way available", should find their way into the 1862 plantations along with the other supplies in 1866-7. 95

One of the trees pointed out to me in this 1862 plot was one of those hybrids denounced by Mr. Broughton (31 July 1871) as "combining the bad qualities of both their parents"† How he could scarcely have called this tree a hybrid if he had not good grounds for believing that it was no part of the original 1862 plantation in which it grew; indeed he states deprecatively (13 Feb 1873) that the hybrids "appear only among seedlings, there being none among the original trees"‡ I may add that in this same "1862" plot there are several ~~plants~~ trees of ~~Officinalis~~ Calisaya which can not be any part of the first planting.

A search through the late Superintendents' papers & the plantation records might very probably give much information as to this & other historical matters. He has stated that he always reckoned 30 percent of every year's

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* McIvor, Report 1869-70.

† This particular tree is a glabrous robusta with the leaf more elongated than usual. Col. Beddome considered it "glabrous pubescens"

‡ Letter to Howard, printed in his "Cinchonology" p 113. The italics

planting as failures & subsequently filled by supplies, a fact which the recent compilers of statistics of the plots seem to have scarcely fully realized.

These remarks may be considered sufficient answer to the first of D. Bidie's arguments (see Par 8). I will now proceed to discuss the remainder of them.

20. Mr. Cross's credibility. D. Bidie thinks Mr Cross' positive statement that the rest plants of "Pata de Gallinazo" to Lidia to be is probably true. To my mind I must say that "probability" points rather the other way. D. Bidie has himself remarked on the "little reliance" that can be placed on that traveller's memory, & indeed we have abundant evidence of its treacherous character. It has made him give two different accounts of this very matter, caused him to forget well-known facts & make unfounded statements about Dr. Spruce, hopelessly confused him over the distinctions between succirubra & micrantha, & supplied him with a totally erroneous name for the "no 3" of this collection" now claim to be C. Humboldtiana. This reminiscence indeed seem singularly

confused, and I do not consider it necessary
to further allude to them. 99

21. Alleged stability of type. Another
point urged by D. Bidie (d.) in favour of the
autonomous nature of this plant is, as he
thinks, the want of a decided tendency,
"as in the case of hybrids", to vary more than
it does in other undoubted species of
Cinchona. I need scarcely remind D. Bidie
that cultivated plants supply us with
abundant examples of known hybrids
as permanent as most species; but as
regards C. robusta our experience in Ceylon
is very different. It is notorious that the
seed is most uncertain, & it is well known
that Mr. Mc Ivor would not trust it. On his
visit to Ceylon in 1875-6 he gave seed of
his best "pubescens" to several coffee planters
here; the result in one case was 10 per cent
like the parent & the remainder varieties of
succirubra & officinalis; and this has been
the general experience here, that I am
indeed surprised to read of a different
state of things in the Nilgiris. In Darjeeling
D. King states that "about half" the plants
from seed came up "officinalis".* Col. Beddome

* In his Report on the Bengal Cinchona Cultivation for 1881-82
D. King distinguishes "six distinct forms" of these robusta hybrids.

could not deny these facts but tried to explain them by careless collection of seed, but I know of cases where this source of fallacy was ~~carefully~~ most carefully guarded against with no difference in the result. Col. Beddome himself must at the last have had doubts, for he allows that it is better to grow the plant for cuttings* Nor indeed this reversion to apparently parent forms that is one of the chief reasons for regarding robusta as a hybrid

But we have more direct testimony of its origin. I am assured by planters of credit that they have grown both glabrous & pubescent robusta from seed of ordinary officinalis, & that it is by no means unfrequent for seedlings of this to appear in ~~the~~ their beds ~~from~~ on estates where no trees but officinalis & succirubra occur. I have myself seen seedlings of robusta self-sown where there are no parent trees of the sort whence they could have been derived, and at one time I was inclined to regard it as a variety of officinalis. There are I think grounds for believing that succirubra generally supplies the pollen & is therefore the male parent, both in the case of robusta (succirubra × officinalis), & of anglica (succirubra × Calisaya)

* Beddome, Report on the Sirkkon Plantations

I do not care to attach any great importance to bark-chemistry alone as a botanical character but it may be noticed, as bearing on the derivation of these trees, that the analyses of their barks (though very variable) confirm as a rule the characteristics of both Red & Crown barks.

22. "Pata de Gallinazo" & "Cuchicara" Barks — C. erythrantha, Pav. — The two remaining arguments advanced by D. Bidie become of less importance in face of what has now been stated. The specimens of "Cuchicara" & "Pata de Gallinazo" collected by Spruce*, are no doubt imperfect ones; they have however proved sufficient and to the most careful of botanists, Mr. Triana, to identify them with C. erythrantha, Pav. † ~~& to be doubtless with the true C. pubescens Vahl.~~ † which Messrs. Spruce & Howard had also, with doubt, referred them. The flowers of the more pubescent specimen of the "Cuchicara" are described by Spruce on his ticket as "deep milk red" a tint I have never seen in any Cinchona flower in the East. The leaves of all his three specimens are more or less pubescent. D. Bidie rather begs the question when

* It should be remembered that these were collected in 1854, before D. Spruce was employed by the Indian Government, & Mr. Cross was engaged.

† C. erythrantha is figured in Howard, Illust. t. 12. It is considered to be C. pubescens Vahl by Triana. The descriptions (but not the figures) in the same work of the following are also referred by Mr. Triana to C. pubescens, Vahl: C. cordifolia, How., C. Palaldea, How. C. subcordata, Pav. & C. subcrenata, Pav.

he argues that the part of the imperfection of ~~these~~ these specimens is in favour of the hilgiri plants being the same, & then proceeds to remark that the "extraordinary coincidence" it would be that two hybrids approaching so closely these wild S. american plants should arise in the hilgiris. It is not admitted that these robusta forms do approach Spruce's specimens very closely; on the contrary such dominant botanists as Sir J. Hooker, Prof Oliver & Mr Thiselton Dyer express themselves strongly to the contrary effect. The wider tube of the corolla in the "Cachicana", which is obvious, & the other distinctions the colour of the flower & the character of the inflorescence are good distinctions. *

On a review of the whole question then I am of opinion that the additional evidence derived from an inspection of these forms of Cinchona in the hilgiri plantations does not by any means prove the improbability - still less the impossibility - of their being, as so long believed, hybrids of local origin between officinalis & succirubra, which opinion is, on the contrary, supported by a large number of facts of observation & reasonable inference.

* I may add with advantage, that in my careful search through the public herbaria of London I did not find any Cinchona from S. America agreeing with either of the leading forms of robusta.

23. Uniformity desirable — I conclusion I wish to add a plea for uniformity in nomenclature. It is very much to be desired that the same plants should bear the same names in India & Ceylon & elsewhere & that obsolete, incorrect & duplicate names should be abandoned. No less than three different Cinchonas are called "crispa" at Darjeeling; it is rightly applied but to one, & that is so ~~little~~ ill-defined that the name might well be dropped altogether. The various denominations bestowed on the hybrids may ~~not~~ be entirely dispensed with as incorrect & misleading: magnifolia, pata, Cuchicara, pubescens, villosa &c. The glabrous & pubescent forms are now allowed on all hands to be of similar nature and a single name is sufficient. Those who are convinced of their hybrid character may use the descriptive title succirubro-officinalis or the shorter name robusta, whilst those who still think them an autonomous species of South America are bound to call them C. erythrantha. Of course I am not speaking of barks; planters & merchants may give these what names they require, in the vernacular, but with these names the

botanist, as a botanist, has nothing to do.

The only other remark I have to make is to suggest whether the time has not now arrived when the Madras Government might adopt the spelling of their genus of plants followed by scientific men. So far as I am aware, there is not one living botanist who writes it in any other way than Cinchona. The matter is a purely technical one; systematists have long ago decided on the rules governing such cases of nomenclature, and the present one is not to be regarded as a subject for discussion. Were it permitted to amend the Latin genera which do not happen to agree precisely in spelling with the names (it may be Russian, Hungarian or Japanese) of the persons whom they are intended to commemorate, many besides Cinchona would have to be altered. But it is not so permitted.

## Part II. Practical Suggestions

24. I have now concluded the remarks I have to make with regard to the Botany of the Cinchona plantations, the subject upon which I was requested to report. But I have reason to believe that some observations upon the principles which ought to regulate, in my opinion, the future management of this fine State property, will be acceptable to the Government. I take it for granted that the recent appointment of Mr. Lawson of Oxford to the Office of Superintendent is ~~sufficient~~ evidence of a desire to maintain the plantations in a high ~~perfect~~ state of efficiency.

25. Management for past six years. It is to be feared that on the whole, during the last few years the conduct of the estates has not been altogether satisfactory. They have been managed too much with a view to revenue, & without that constant care & oversight which was (at any rate

for many years) bestowed by the late Superintendent. I consider that both the plantations and the trees have been overworked. Though many trees which have been frequently barked in Kadurvatan & Hooker still appear healthy & cannot be said to have been much hindered in growth; yet owing the very imperfect renewal of bark - only in short strips & patches - it is now impossible to get any good samples for, or to practise the shaving method. I think that very many more trees should have been left untouched; we have yet to learn the effect of removing the bark upon the longevity of the trees, & the real life-history of Cinchona in the East. The recent supplies & renewals do not appear to have been very successful, the number of failures being very large.* No vigorous attempts towards increasing the specially valuable sorts, & the recent introductions have been made; even the Pitayo Barks - botanical at such cost & trouble, and specially recommended in 1878 by Govt. for further cultivation - remain little more than curiosities, and no

* In the three official years 1878-81 no less than 33,407 Red Barks have died upon Hooker Estate alone (Beddome's Report, app. B); and I understand that the mortality of Crown Barks put in since has reached as much as 80 per cent

effort to propagate the valuable Santa Fé has been made since Mr. Cross's departure. *
Selection by cutting a seed pan the best of known analyzed trees (of which system steadily persisted in ~~by~~ the Dutch in Java have so largely increased the value of their bark) has not been practised, nor is propagation of the delicate sorts by grafting on more hardy varieties caimed on. I know from experience that seed has not always been carefully collected, & that there has been a good deal of confusion between "pubescens" & succirubra.

2.6. Necessity for a good propagator —
Under a new régime we may expect to see attention paid to these things, as well as to experiments in artificial hybridization † & its results, the effects on ~~the~~ longevity & health of the processes of stripping & shaving respectively, &c. I venture however to suggest that, the assistance of a skilful propagator being necessary, such an addition to the staff of the Superintendent may (if necessary) be made. —

† This subject was specially insisted upon in the Report of the Cinchona Commission of 1878.

* C. lancifolia (Par 14) should also be propagated. The latest analyses of this in Java (Mosers Report 20 Feb 1883) show total alkaloids varying from 4.6 to 7.2 per cent, of which Quinine is from 1.1 to 2.0. Though less valuable than officinalis this species is rather better than the majority of the Java Calisayas.

27. A scientific Culture the object for the future. ~~Increased~~ Progress in improvement in knowledge & practice, and not gain, should be the main objects of Govt in the ~~future~~ management of their plantations. I do not expect that the ultimate end ~~Agent~~ of the enterprise is the production of a cheap & efficient febrifuge for India & the East. But this great purpose will be in no way retarded by the course recommended; on the contrary, as all that adds to our knowledge of bark-cultivation will lead to the increase of private plantations & their successful & profitable culture, it must be promoted & hastened. The subject is, it must be admitted, complicated by various other considerations; but probably the final realization of that grand & beneficent Scheme is more likely to be immediately effected by private enterprise in Europe or in India itself, than by any local Govt manufacture of alkaloids. Humanity will be equally benefitted in the one case as the other. For the present this subject, however, may be allowed to rest.*

* It has been thoroughly discussed in the Report of the Cinchona Comm. of 1878, pp. 2–11; & with their opinions on the matter I generally agree.

Meanwhile the Govt. possesses a very valuable property, which worked without stinting the expenses necessary for the highest experimental cultivation cannot fail to return a profit for many years to come. More than twenty years ago the Home Government very justly remarked (Despatch Sec. of State Jan. 1863) that the Cinchona experiment could not be regarded as a mere money speculation "nor are the commercial advantages that may be derived from it to be considered as other than a secondary consideration; though of course a return for the outlay & the spread of Cinchona cultivation & private enterprise are very desirable in themselves" How little do these words seem penned & the present financial success have been anticipated, and with how much more free do they become, when even the outlay itself has been more than repaid, & a large and enterprising class of private growers of Bark is in existence.

28. Necessity of a Chemist. The recent appointment is a step forward, but for any satisfactory progress to be made the Chemist as well as the experimental Physiologist & Botanist is a necessity.

In it must be remembered that it is alkaloids we want to grow, not bark only, and the cultural superintendent is likely to be able to give us little ~~practical~~ accurate information about them. Further, the chemist must be on the spot, among the trees constantly, & always in readiness to work in unison with the superintendent as one man at ~~mutually~~ jointly planned investigations. I desire to press this strongly, as the want importance of correct analyses does not appear to have been realized by the members of the Commission of 1878, in ~~his~~ their office by Col. Beddome.*

The Madras Government in supplying this deficiency will in fact be merely taking up again the work which was unfortunately dropped some eight years ago on the sudden resignation & disappearance of Mr. Broughton. The value of this chemist's researches is unquestioned, & his results are constantly quoted & acted upon. But his work was left quite unfinished, and it is to be feared that he got but scant-

* Mr Cotton however after his visit to Ceylon completely changed his views & has expressed the opinion that the analyst is "all important". This opinion has been commended by Govt to the Secy of State (G.O. 1518, 13 Oct 1881)

assistance ~~in~~ from the late Superintendent.
We noticed, too, a good deal in the bark as to
the names & nature of the trees which were
then very unsettled. Since his time, this
has been changed, and chemists have also
given us a great mass of facts as to the
chemical composition of the barks of all the
cultivated kinds, the main characteristics
& general relative value which is in the
market are now quite well understood.
But there are ~~still~~ many questions of the
greatest value to cultivators still pressing
for solution. The range of difference in the
proportions & quantities of the alkaloids in
barks of trees of identical botanical type is very
large; and the same is true of the plants
raised from seed of a single tree. We know
nothing of the causes of these individual
differences. There is even variation in analysis
of bark raised from cuttings of one & the
same tree; yet it has been shown* that in
grafts the stock has no influence on the
alkaloids of the grafted shoots. So, then,
clear that in the production of alkaloids, the
inherited nature of the tree is largely influenced
by certain surrounding conditions, & there is

*Report for first quarter of 1883. of the Java Cinchona Enterprise.

is most important we should discover. The apparently good results which Mr. Broughton obtained from experimental manuring have never yet been corroborated or disproved. Even the cause of the increase of alkaloids is involved back in but little understood & we probably are unable to avail ourselves of it to the full extent. The influence of age on alkaloidal composition in the various species is only guessed at from experience, but no series of analyses of selected trees at frequent intervals from the commencement of their lives onwards is available. There are samples of the investigations which any an analyst resident on the spot & working with the Superintendent can hope to decide.

29. Position of the Government of Madras

All such researches however can only be properly carried on in a Government establishment where the Officers can devote themselves in a spirit of pure research to a work which must of necessity be spread over many years. And I will add that it is to the

Government of Madras that all who are interested in Cinchona in any of its various aspects necessarily look to take the lead. No other Government in fact will be likely to undertake it. In Bengal, the production of febrifuge at present engages the whole attention of the staff, whilst here in Ceylon, the Government possesses no plantations ~~(Liverpool Viscount)~~ and is in no position to expend public money without an evident & quick return. It is true that from Mr. Mowens in Java we have learnt much, but even there the object has ever been revenue ~~not to Govt.~~, & we ought not to be dependent upon what a foreign Government ~~Official~~ may ~~choose~~ please to make public. On the other hand it was Madras that was formerly in the front position. As the pioneer of Cinchona-growing in India it proved that the ~~best~~ barks could be grown there, and initiated a great industry. This it did as an experiment & with a judicious liberality, at immense cost. The excellent system followed has, for fortuitous circumstances

come to an end; under the very favourable present conditions, one cannot but expect to see it revived.

30. Selection by analysis. To go into any details of cultivation would be out of place here, but I may express the conviction that in the present state of our knowledge, the most promising direction for the improvement of the trees as alkaloid-yielders is selection based on analysis. This is to be effected by the isolation of trees with high analysis, precautions to prevent cross-fertilization, care in collecting seed, analysis of a selection of the resulting plants, destruction of all that do not reach the standard of their parent, again isolation of the best trees & so on for several generations. The same principle may be more readily applied to grafts & cuttings. It is clear that in such a cultivation it is the chemist who regulates the procedure: all plants which his analyses condemn are ~~for~~ ruthlessly destroyed. Those which sustain his test are preserved to become the parents of improved successors.

been obviously much neglected & I see no advantage to be derived from their maintenance beyond the profit from bark sales.

30. Changes required. The desirability of a plantation at a lower elevation & with a more equable rain-fall has been already recognized by Government (C.O. 1280, 29 Aug. 1881). Neither C. Ledgeriana nor any of the varieties of C. Calisaya (of which there is good reason to believe there are some valuable ~~sorts~~ not yet in cultivation) succeed on the existing estates* a site should be selected at about 3500-4000 ft. in sheltered forest land. In some estates in such situations in Ceylon C. Ledgeriana is doing very well & has more than equalled the Java trees in alkaloidal yield.

On the other hand the utility of keeping up the Hooker & Wood plantations might be again considered. They have

* The Calisaya-forms hitherto introduced make very bad growth & are short-lived. They are also poor Quinine-yielders. Of the 15 barks of this kind selected by D. Bidie for analysis, only two afforded over 3 per cent of the alkaloid (no. 2 & 14 gave 5.55), whilst one (no 21) gave only a trace, and all showed a strong tendency to develope the least desirable of the alkaloids, Cinchonine (as much as 4.40 in no. 17). Some may be found at the lower elevation, but experience in Ceylon is not favourable to their cultivation.

32. Arrangement & Records and Publication of Results.

The only other suggestion I have to offer - is perhaps scarcely required. It is that all the records, papers, notes & Orders connected with the Government Plantations be brought together & properly arranged and classified, so as to be readily available for reference. There must be much in Mr. McIvor's papers supplementary to his rather meagre annual Reports; & probably Mr. Broughton's notes would repay perusal. At all events the history of the plantations cannot be followed without ready access to all the records. In the future, Government should take care that accurate note is kept of all work done in the plantation plots (as to deaths, supplies, removals & banking operations) as well as in the experimental houses & nurseries & in the Laboratory.

I will conclude by expressing the opinion that all results should be made available promptly to the public in Annual Reports, which also ought to be easily obtainable.

Henry Trimen

135

GENERAL
No. 5.

No

From Director R. Bot. Gardens, Ceylon.
To Secy to Govt., Revenue Dept. Madras
Dated, Peradeniya 30 June 1883

GOVERNMENT OF MADRAS
9 JUL 83
REVENUE DEPARTMENT

Referring to your
No.

SIR,

I have the honor to forward herewith, under separate cover, my Report on the Government Cinchona Plantations of the Nilgiris.

2. In the event of this being printed I should feel obliged by having a proof — with the original MS. — submitted to me for correction.

3. I beg to acknowledge the receipt of copies applied for of Major C. Walker's Report of 1878; Manual of the Nilgiri District; and D. Brandis's Suggestions for Forest Administration in Madras

I am, Sir,
Your obedient Servant,

Henry Trimen

REVENUE (1883) DEPARTMENT.

No. 1387

From The Director of the Royal Botanic Gardens Ceylon.

Dated 30th June 1883

Recd. 7th July 1883

No.

Encl 1.

SUBJECT.

Forwarding his Report on the Govt Cinchona Plantations on the Nilgiris

Recd 12/7

30-7-83. 8-22-7-83
Nilgiris 24-9-83
21-9-83 24-9-83
23-9-83



TH JULY 1883, No. , REVENUE.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

To print this memorandum in the Abstract in P.P.

1 Caps.

READ—the following letter from Dr. H. TRIMEN, Director, Royal Botanical Gardens, Ceylon, to the Secretary to Government, Revenue Department, dated Peradeniya, 30th June 1883:—

ABSTRACT.—Forwarding his Report on the Government Cinchona Plantations on the Nilgiris.

ENCLOSURE.

From Dr. H. TRIMEN, Director, Royal Botanical Gardens, Ceylon, to the Secretary to Government, Revenue Department, dated Peradeniya, 30th June 1883.

I have the honor to forward to you my Report on the Cinchona Plantations of the Nilgiris, which I have divided into two portions.

1 space 1.—1

PART I—*Botanical Observations.*—In accordance with the invitation conveyed to me on 10th April that I would "inspect and report upon the Botanical problems presented by the Nilgiri Cinchona Plantations," I proceeded, with the sanction of this Government, to Madras, and reached Ootacamund on May 5th. During the succeeding fortnight I investigated the plantations at Dodabetta, Naduvatam and the Pykara river. Throughout the examination I was so fortunate as to have the company of Dr. Bidie—who has an intimate knowledge of the plantations—and of my old friend Mr. Lawson, who has lately been appointed Superintendent of them;* at Naduvatam we were joined by Major Campbell Walker, Conservator of Forests, Mr. Gass, Deputy Conservator of Forests, under whose charge the plantations actually were; and Mr. Lorne Campbell, a Member of the Cinchona Committee of 1878.

2. *Previous Preparation.*—In addition to a somewhat critical study of *Cinchona* made during my connection with the British Museum, and the facilities I have since enjoyed in Ceylon from an acquaintance with the cultivated kinds, I may add that during a visit home last year, I took the opportunity of renewing my acquaintance with the dried collections, both at Kew and the British Museum. At the former establishment, I paid special attention to the original specimens sent home from the Andes by Spruce and Cross and to Colonel Beddome's and Mr. Bidie's recently received series from these plantations; whilst at the Museum I re-examined chiefly the original type-specimens of Pavon, and a fine numbered set collected in the Nilgiri plantations themselves by the late Mr. McIvor in 1873, and presented by the Secretary of State for India.

3. *Botany of Cinchona in general.*—So many persons have reported upon the botany of the trees under review that they possess quite a small literature of their own, and it might be supposed that the subject was thoroughly exhausted. In past times Mr. Markham, the late Mr. McIvor, and especially Mr. Howard, and more recently Colonel Beddome, Mr. Cross and Dr. Bidie have paid particular attention to the troublesome questions connected with the nomenclature of the several kinds. With regard to some of these writers, I trust I am in no way forgetful of the many and great services that they have rendered to the Cinchona enterprise when I feel bound to say that from the botanical point of view, I think it is much to be regretted that circumstances should have thrown this very difficult genus into the hands of those who have had so little of the requisite training and experience in systematic botany for dealing with it effectively. It ought indeed to be generally understood, that however eminent a writer may be as a quinologist, a traveller, or a gardener, if he can see important botanical characters in the height of a tree, the chemical constitution of its bark, or the colour if its leaves, he is *ipso facto* disqualified to pronounce on questions of classification. A number of published names have, however, been defined by nothing more than some such botanically trifling or variable distinctions, and should not be recognised until properly characterized. There is nothing about the genus *Cinchona* in its botanical aspects to warrant it being treated on any principles different from those which the systematist is ordinarily accustomed to employ: for authors who know little of those principles or have had no experience in the application of them to other groups of plants to attempt to arrange the forms of so involved and complicated a genus as this can only lead to failure and confusion.

* At the time of my visit, Mr. Lawson had not been actually placed in charge.

It may be said that botanists themselves disagree largely on such points: their differences, however, appear greater than they really are. There is rarely any serious disagreement as to the relative value of characters, though there is much as to the *grade* which the individuals or groups defined by them should occupy. Thus a group which one naturalist will consider as a single species with several varieties will be four or five species to another; or a small set of allied species or a single isolated one may be regarded as a distinct genus by one botanist, and be relegated to some larger one by another. Such differences there must always be, for they represent the more or less synthetical or analytical bent of individual minds, but naturalists have long left off discussions over such matters, which, indeed, since the general recognition of affinity by descent, have lost entirely the significance they once had.

We possess, however, arrangements of the whole known species of *Cinchona*—worked out simultaneously but quite independently—at the hands of two eminent botanists both familiar with South America and the wild trees, the late M. Weddell of Paris and M. Triana of New Granada,* and it is to these works and especially to that of M Triana that we have to go in the endeavour to find sound views as to the limits of the species (which are nearly all of extreme variability) and their correct nomenclature. Unfortunately in neither treatise are descriptions given; I venture to think that had M. Triana attempted to accurately define his thirty-six species he would have considerably reduced their number. Too many are still little more than varieties of *barks* distinguishable by the collectors or by merchants, and do not represent *plants* with such a combination of anatomical characteristics as was necessary to constitute a recognizable species.

4. *The kinds in cultivation in the Nilgiris.*—The now well-known story of the successive importation of different sorts of Cinchona from South America to the Nilgiris is told in official detail in the five blue-books (issued from 1863 to 1877) so far as to the middle of 1875, and has been briefly summarized in Major Campbell Walker's excellent report of 1878. It is much to be regretted that the late Superintendent's reports are so meagre in detail as to render it impossible from them, to trace with any minuteness the history of the kinds which thus came under his charge. The latest to which I have access is dated 31st July 1875 † and professes to give the botanical names and numbers of the plants of each "species" then cultivated. I need say nothing here about the numbers given; they have been since shown to be exaggerated to an almost incredible extent; but as to the names, the twelve kinds given were no doubt generally at that time distinguished in the plantations.

| | | |
|---|---|---|
| 1. C. succirubra | ... | Red Bark. |
| 2. C. Calisaya. | | |
| Do. | var. Lutea | Yellow Bark. |
| Do. | var. Vera | |
| 3. C. officinalis | | |
| Do. | var. Condaminea | Original Loxa Bark. |
| Do. | var. Bonplandiana | Select Crown Bark. |
| Do. | var. Crispa | Fine Crown Bark. |
| 4. C. lancifolia | ... | Pitayo Bark. |
| 5. C. nitida | ... | Genuine grey Bark. |
| 6. C. species without name | | Fine grey Bark. |
| 7. C. micrantha | ... | Grey Bark. |
| 8. C. peruviana | ... | Finest grey Bark. |
| 9. C. Pahudiana. | | |
| 10. C. lanceolata-leaved variety of C. officinalis. | | |
| 11. C. Pitayo, raised from imported seed. | | |
| 12. Do. Plants brought out by J. Simpson. | | |

The nomenclature of the first nine kinds dates from Mr. McIvor's first report, 31st May 1862, but some changes had been made since that date. At that time *C. officinalis* was collectively called "*C. condaminea*" and the three varieties were respectively "var. *Uritusinga*," "var. *Chahuarguera*" and "var. *Crespilla.*" No. 4 was then said to afford "Crown bark" (not Pitayo bark) and No. 9 at first went under the name of *C. lucumæfolia* of the Dutch.

Nos. 9 and 10 first appear in the returns for July 1869. No. 10 was the tree observed by Mr. Broughton in 1868 to be so rich in quinine, and provisionally called by him ‡ "var. *lanceolata*," which name was in 1872 altered, in accordance with Weddell's nomenclature, to var. *angustifolia*. The last, No. 12, was added in January 1871.

As a correct chronology is important it will be well to give, for easy consultation, the sources and date of reception of these various kinds which composed the plantations of July 1875.

* H. A. Weddell, Notes sur les Quinquinas; in Ann. des Sc. Nat., Botanique, ser. 5, XI, page 346, and XII, page 24, (1869).
J. Triana, Nouvelles Etudes sur les Quinquinas, Paris, 1870 [1872].
† Blue Book V, page 189.
‡ Blue Book III, page 237.



| | | | |
|---|---|---|---|
| 1. *C. succirubra.* | Seeds, South America, Spruce. | February | 1861. |
| | Plants, South America, Cross. | April | 1861. |
| 2. *C. Calisaya.* | Plants, South America, Cross. | April | 1861. |
| | Plants, Java (originally collected in South America by Hasskarl in 1854), T. Anderson. | December | 1861. |
| | Seeds, South America, Markham. | „ | 1865. |
| | Seeds, Mr. Money (? Including *C. Ledgeriana*). | „ | 1865. |
| | Plants, Kew (originally from seeds collected in South America by Weddell) "*Josephiana, glabra.*" | „ | 1866. |
| | Plant, J. E. Howard, "superior variety." | „ | 1867. |
| 3. *C. officinalis.* | Plant, J. E. Howard (from seed collected by Don Riofrio in South America). "*Uritusinga.*" | April | 1862. |
| | Seeds, South America, Cross. | February and March | 1862. |
| 4. *C. lancifolia.* | Plants, Java (seeds originally collected in South America by Karsten), T. Anderson. | December | 1861. |
| 5. *C. nitida.* 6. *C.* species without name. 7. *C. micrantha.* 8. *C. peruviana.* | Seeds, South America, Pritchett. | January | 1861. |
| 9. *C. Pahudiana.* | Plants, Java (originally collected in South America by Hasskarl in 1854), T. Anderson. | December | 1861. |
| 10. Found among progeny of No. 3. | | | |
| 11. *C. Pitayo.* | Seed, South America, Cross. | | 1869. |
| 12. — | Plants, brought by Dr. Simpson from England | „ | 1870. |

Since the date of the Report the principal new sorts that have been brought into the plantations are the New Granadan (Columbian) Bark-trees. Mr. Cross arrived at Ootacamund on 8th October 1880 with three plants of *Santa Fe* (Soft Columbian) and six of *Carthagena* (Hard Columbian) which he had himself collected in South America. Probably seeds or plants of *C. Ledgeriana* for the Government Plantation in Java were also received in 1872—1875 or thereabout, but I find no record of their reception. Quite recently, in March 1883, seed of varieties of *Calisaya* stated to be the "verde" and "morada" of Bolivia have been purchased from a London firm and numerous seedlings have been raised.

5. *The Hybrids "pubescens" and "magnifolia."*—Mr. McIvor died in June 1876, and up to the arrival of Mr. Cross as above noted, the names in the list given ~~in the last paragraph~~ of this paragraph were also commonly employed to designate trees which it was believed were generally recognised and used. In addition however to these, the two names at the head resulted from the crossing of *C. officinalis and C. succirubra.* These were first brought prominently into notice by Mr. Broughton in 1869;* Mr. McIvor, in his report for 1869-70, also remarks on the readiness with which hybridization occurs and states that some "very interesting hybrid varieties" had been raised from seed. The name "*pubescens*" dates from 1872 when it was bestowed as a varietal (hybrid) name by Mr. Howard † on a plant, the bark of which afforded him a very high percentage of alkaloids; that of "*magnifolia*" seems to have arisen from a faulty identification of the leaves with the plate of *C. magnifolia*, Pav. in Howard's "Illustrations" ‡ by Mr. McIvor. The hybrid nature of these plants remained unquestioned, and their rapid increase led Mr. Howard to write in 1876: § "it seems difficult now to obtain seed from Ootacamund that is not hybridized." Dr. Bidie also in 1878 ‖ was much struck with the strong tendency of the species to cross and says of the "hybrid called *C. pubescens*" that "specimens submitted to Dr. King and myself.....show that it is a hybrid with a strong strain of the *officinalis* family, and apparently a cross between *C. officinalis* and *C. succirubra.*"

Similar experience was recorded as early as 1870 from Sikkim, Ceylon and Java, and up to the end of 1880 there was a general consensus of opinion as to the probable origin of the plants.

* Blue Book III, 239: V, 48, and Journ. Linn. Soc., XI, 475.
† Journ. Linn. Soc., XIV, 160.
‡ Tab. 13. This represents a number of different genus, now *Cascarilla magnifolia*, Wedd.
§ Quinol. Ind. Plants., p. 84.
‖ Appendix to Rep. of Cinch. Committee pp. 42-45.

6. *Mr. Cross's and Colonel Beddome's opinions.*—In January 1881, Mr. Cross sent in a report on the plantations, which was printed in the following June. Early in the same year, the plantations having been transferred to the Forest Department, the Conservator, Colonel Beddome, was directed to inspect and report upon them. The valuable notes he prepared in June, together with further observations by himself and by Mr. Cross in August, were printed in September, and as the botanical points in dispute have mainly arisen on the opinions expressed in these documents, it is necessary to give them particular attention. This is especially due to Colonel Beddome, who has a well-merited reputation as a skilful field botanist: as Mr. Cross was the original collector of most of the kinds, and familiar with them in the wild state in their native localities, he would also seem to have claims to a hearing.

The principal point insisted on by the latter in his report refers to the hybrid form called "pubescens." This he says is really a "narrow-leaved variety of red bark" and was called "Pata de Gallinazo" by the bark-collectors in South America. He could not see in it "a particle of the characteristics" of *C. officinalis*, and he observes that the trees may be found at Naduvatam "not unfrequently among the first-planted trees there." We further informed Colonel Beddome that he himself sent *seeds* of this "Pata de Gallinazo" to the Nilgiris at the same time as *succirubra*, but not separate from that species; in a letter to Colonel Beddome, however, dated 10th August 1881,* he gives a very different account of the mode of its introduction, in which he states that he obtained *plants* in the bottom of a ravine on Chimborazo to fill up one of the packages of *succirubra*, and that his companions, two lads, the sons of a bark-collector, identified them at once as Pata de Gallinazo. He also calls "a new and undescribed species."

All this was absolutely new to everybody; for not a hint of anything of the sort is to be met with in any of the voluminous reports or papers referring to the collection of the Bark-trees for India. Colonel Beddome, however, was quite convinced of the accuracy of Mr. Cross's recollections, and supported his assertions. He, too, could see in the plants none of the characteristics of a hybrid, and considered that they had evidently been in the plantations from their commencement.

Cross afterwards restricted his previous remarks to "*magnifolia*" only, and said that "*pubescens*" was a different species from "Pata de Gallinazo;" after some further consideration, he pronounced that "*pubescens*" was the real *C. succirubra* and that the plant, hitherto grown under that name, was not that species but *C. micrantha*, or some other grey bark! Colonel Beddome, however, recognized varieties of a single species only in "*magnifolia*" and "*pubescens*," and this, he thought, quite distinct from both *C. succirubra* and *C. officinalis*. With regard to the supposed numerous varieties of *C. officinalis* neither Colonel Beddome nor Mr. Cross could trace them out. The former speaks somewhat doubtfully as to the nature of what passes as "*Uritusinga*" on Dodabetta, of which he believes there are about 1,000 there and about 12 at Naduvatam. As to *C. Calisaya*, he could distinguish four varieties, ordinary "*Calisaya*," "*Ledgeriana*," "*anglica*" and "*javanica*."

A paragraph (45) is devoted by Colonel Beddome to an "unknown species" with very rough corky bark and leaves hairy on both sides, of which five trees were found on Dodabetta. Mr. Cross at once pronounced this to be "the celebrated *C. crispa* of the Loxa mountains, a packet of the seed of which we collected when collecting the *officinalis*;" he added that it gives a very valuable bark and that he sent the seed to Mr. McIvor who told him that it never germinated.

Mr. Cross sent home thirty samples of bark for analysis by Messrs. Howard. In his remarks accompanying No. 18 ("Pata de Gallinazo") Mr. J. E. Howard—who also seems to have fully accepted Mr. Cross's statements—says† that it is *C. coccinea* of Pavon† and not red bark at all. In abandoning his former view of the hybrid nature of "*pubescens*" Mr. Howard merely says it is one of the "cognate species to *succirubra*."

Colonel Beddome collected and dried good typical specimens of the 18 different kinds of *Cinchona* he could recoguize, and these were forwarded to Kew with the object especially of the "Pata" (No. 2), "pubescens" (No. 3) and the "unknown species" (No. 18) being there identified.

7. *My own views and those of the Kew botanists.*—In September of the same year, I had the pleasure of receiving Colonel Beddome during his short visit to Ceylon. He found on the estates here abundance of Cross's "Pata," and some of the Nilgiri "pubescens." In his report to Government, dated 3rd October (No. 167), by some strange misapprehension, he quoted me as supporting his views as to the nature of these trees. They had, of course, been long familiar to me, but I had always carefully avoided committing myself to a definite opinion about them, though strongly leaning towards the view of their hybrid origin. I therefore found it

* Enclosure in No. 422.
† Pharmaceutical Journal, October 1881, page 351.
‡ This was Spruce's determination of the real "Pata" of Chimborazo (see Weddell, "Notes" l.c. page 30).

† Enclosure in no. 267 (July 1881)



necessary to state my position, which I did in a letter to the "Ceylon Observer" newspaper, 27th November 1881. I may here be permitted to quote the conclusion of this communication. The name *robusta* which I have proposed to adopt was, Colonel Beddome informed me, in use on some estates in South India; it is now commonly employed in Ceylon for the trees in question.

"I also desire to say a few words as to the name which this Cinchona should bear. It is I think much to be regretted that the name "Pata de Gallinazo" should have been brought out of its obscurity by Mr. Cross and adopted (even provisionally) by Colonel Beddome. This is a mere bark-collector's name and is used in different parts of the Andean chain for at least six different kinds of bark. That which has the best claim to it (as having been first published and more often used) is the best sort of grey bark collected by Pritchett in Huanuco and referred to *C. peruviana* or *C. micrantha*.

* * It is, of course, the case that the name is also used for the "Cascarilla serrana" or Hill Red Bark, which Dr. Spruce obtained on Chimborazo at 8,500 to 9,000 feet, and with which Mr. Cross (who accompanied Dr. Spruce as gardener) now identifies the plant under discussion.* * * *

It is to be hoped that the copious dried specimens sent home by Colonel Beddome for comparison with types in the London Herbaria may clear up the matter; but this cannot be very confidently expected. Meanwhile, I would recommend the suppression of the Spanish name of "Pata de Gallinazo" for our "hybrid." If the tree has been duly described and named, we shall, of course, get the proper appellation in time. If not or till then—since the names "pubescens," "magnifolia," "villosa," and others are all, for various reasons, unavailable—we cannot, I think, do better than adopt that already coming into use in Southern India, *robusta*, which is a very appropriate one. By using this, we do not commit ourselves to any views as to the origin of the plant, whether on the plantations of the Nilgiris, or the higher slopes af Chimborazo."

Colonel Beddome's specimens were duly examined by the Kew botanists. Mr. Dyer in his letter upon them (24th January 1882) agrees that "*magnifolia*" and "*pubescens*" are practically one and the same plant. As to "Pata de Gallinazo," he points out that Mr. Spruce has described this and the closely allied "Cuchicara" in his report (Blue Book I, pages 116, 117), that his specimens are in the Kew herbarium, and that "although there is some resemblance in the foliage it may be said with some certainty that the Nilgiri '*magnifolia*' is not the 'Pata de Gallinazo' of Chimborazo." It is further remarked that Spruce's specimens have been referred by that botanist and by Howard to *C. erythrantha*, Pav., and that "this identification is probably correct;" also that Mr. Triana considers both these specimens and *C. erythrantha*, Pav. as belonging to the species *C. pubescens*, Vahl. It is decided that "the most probable account that can be given of the forms '*pubescens*' and '*magnifolia*' is that they are hybrids between *succirubra* and *officinalis*."

With reference to the "unknown species" (No. 18) no opinion is expressed; as the specimens collected by Mr. Cross were in private hands no comparison could be made.†

8. *Dr. Bidie's Reports.*—Meanwhile Dr. Bidie had been requested by Government to enquire into Mr. Cross's assertions, and to collect a good series of all the Naduvatam Chinchonas and their barks. In his letter (No. 199), dated 3rd March 1882, he summarily disposes of the notion that any mistake had been made as to the plant known as *C. succirubra*. He shows that "*pubescens*" is not, as Cross maintained, *C. succirubra*, but suggests that it will probably be found, on comparison, to be "identical with Spruce's pubescent [illegible] of Llalla," above referred to. As to the "*magnifolia*" Dr. Bidie considers Mr. Cross's identification with "Pata de Gallinazo" "will probably prove correct." For both these opinions his basis is Spruce's brief description above noticed. In a further letter (No. 284), dated 29th March, written after perusal of the remarks of the Kew botanists, Dr. Bidie still supports the above contentions, on the grounds of (*a*) the occurrence of the plants in the oldest plots of the Nilgiri plantations, (*b*) the probability of the truth of Cross's positive statement, (*c*) the improbability of two hybrids so similar to Spruce's two plants arising spontaneously, (*d*) the want of tendency to depart from type, and (*e*) the fragmentary character of Spruce's specimens (as gathered from his narrative) rendering the comparison possibly fallacious. Sir J. Hooker in reply (letters, dated 13th June, 7th July and 3rd August) can see nothing in these observations to cause him to alter the views previously expressed that "the plant called '*magnifolia*' is not the 'Pata de Gallinazo' collected by Spruce; neither is the plant called '*pubescens*' the '[illegible]' of the same traveller."‡

A collection of well selected and dried specimens of 38 different forms was made by Dr. Bidie (with an accompanying series of the barks from the same trees) and forwarded to Kew

* Colonel Beddome's report (page 8.) contains the extraordinary assertion (derived from Mr. Cross?) that Dr. Spruce "could never have seen the trees." But the latter describes their appearance, bark and leaves—the flower and fruit he did not get—in his paper in the "Journal of the Linnean Society" iv. page 185. Indeed, it is Mr. Cross's share in this matter that is the novelty.

† On the identification of this plant see paragraph 16 of this Report.

‡ Paragraph 19—22 of this Report continue the discussion of these questions.

[The discussion of these questions is continued at p. 8 of this Report, paragraphs 19 to 22.]

where I had the opportunity of examining them in July last.* The trees supplying these were permanently labelled with the same numbers as the barks and specimens, so that they can be readily referred to at any time. The examination of Dr. Bidie's collection led to the following remark by Sir Jos. Hooker in his letter of 3rd August: "Crossing has evidently gone on so extensively that no one but a botanist accustomed to the *facies* of living Cinchona plants could pronounce an opinion upon the mixture of forms with any authority or without the risk of adding to the confusion of nomenclature."

9. *C. succirubra*, Pav.—I now proceed to the observations I have to make on the botanical characteristics and names of the trees inspected by me in the Nilgiri plantations.

In regard to Red Bark, I can very confidently endorse the opinions expressed by all the botanists who have examined the matter, that the well-known tree which forms the bulk of Naduvatam is the true *C. succirubra*, Pav. I have examined Pavon's own specimens in the British Museum which precisely correspond with the ordinary Red Bark of India, Ceylon and Jamaica. This has the leaves generally more or less pubescent or puberulent beneath, as is the case with Pavon's specimens; and Mr. Howard is mistaken in saying† that the common plant in India is perfectly smooth. Dr. Spruce's description at p. 104 of his octavo report of 1861 is very good.

I must, however, allow that I found *succirubra* in Naduvatam a more variable type as to foliage than I am accustomed to in Ceylon. Among the large trees in the original plots are to be noticed, besides the ordinary kind with leaves glabrous above and pubescent beneath, not a few which have leaves at least when mature altogether smooth; some again are persistently hairy on both surfaces. There were also a few trees with remarkably narrow leaves attenuated at the base. As a rule, the leaves are less bullate and smaller than in Ceylon, but it must be remembered that Naduvatam is a somewhat higher elevation than this species is usually grown at here. I have no doubt that some of the leaves from the Naduvatam red barks would be called "pubescens" in Ceylon, and I am also convinced that this is partly due to many plants and seeds of this kind having been actually sent out from the Naduvatam plantation under the latter name.

A few miserable and scarcely recognizable little trees were all I saw of *succirubra* on Dodabetta.

10. *C. Calisaya*, Wedd.—I have little to say about the plants included under this name represented in the Nilgiris.‡ There are patches both on Dodabetta and Naduvatam, but neither contain any well-grown trees. As may be seen from the list in paragraph 4, they are of various origins. A plot on the east slope of Dodabetta low down planted in 1865 (said to be from Mr. Money's seed) presents the extraordinary mixture of varieties that one is accustomed to in seed from Java. The bulk are the varieties known as "*jaranica*" and "*vera*" in Ceylon, but there are also a few trees of *succirubra* and *micrantha* and two or three of what I am accustomed to consider a hybrid between *Calisaya* and *officinalis* occasionally met with in Ceylon plantations. Among them, too, the Superintendent, Narrainsawmy, pointed out two or three which he said Mr. Moens, in his visit in 1880, had pronounced to be *C. Ledgeriana*, but these were not in flower, and I am not able to distinguish this species with certainty from foliage alone.

At Naduvatam, as would be expected from its locality, the *Calisaya* varieties are rather better in growth, but even here they are gradually dying out. Dr. Bidie selected no less than fifteen sorts for his dried collection which exhibit a wide range in size and shape of leaf, size and colour of flower and form of the seed-capsule. A large and broad-leafed form is that which grows most vigorously. I saw nothing like *C. Ledgeriana* among them. As might be expected, a fair number of the very broad-leaved large-flowered hybrid with *C. succirubra*, *C. anglica*, How.,§ were to be seen in Naduvatam.

11. *C. officinalis*, L. (*C. condaminea*, Humb. and Bonpl.)—Dodabetta plantations are almost entirely composed of this species which grows there to perfection; there are also a large number at Naduvatam. In common with other botanists who have been recently over the plots I failed to detect many marked varieties; indeed what particularly struck me was the remarkable uniformity of type prevailing throughout the vast expanse of Dodabetta‖; no greater variety prevailed than in a plantation of oaks, elms or poplars. If it be desired to distinguish

* The dried specimens have been transferred to the herbarium here at Peradeniya. Dr. Bidie has since prepared and transmitted to the Pharmaceutical Society's Museum in London, a still larger series but with the same nomenclature.

† Pharmaceutical Journal, October 1881. Nor do I think he is correct in stating that bark of "Pata," of "pubescens," or of "Huchicara" is sent home from India or Ceylon under the name of "Red Bark;" though, no doubt, *succirubra* bark may have been sent as "hybrid pubescens."

‡ I notice that in the most recent enumeration of the trees (31st March 1882) no estimate of the number of Calisaya is attempted, the space being left blank.

§ Well figured by Howard in his "Quinology" t. 10. He raised it from seed sent from the Nilgiris by Mr. Broughton and taken from an ordinary *Calisaya* which had doubtless been crossed by neighbouring *succirubra*.

‖ McIvor in 1869 says (Report, par. 9) that from the three original kinds of Crown Bark, at least seven distinct varieties had been raised. He is said afterwards to have distinguished as many as twenty-two sorts. Mr. Broughton mentions as many as twenty.



by names the differences in the width of the leaves it would appear that the broadest represent *C. Uritusinga*, Pav. and the narrowest the true *C. crispa*, Taf; the intermediate ones being the vars. *Bonplandiana*, How. and *angustifolia*, Wedd. I am unable to separate these, which completely pass into one another. I had expected to find here something more distinctive as *Uritusinga*. Two varieties bear the plantation name of "*angustifolia*" and are distinguished as "No. 1" and "No. 2;" the latter has by no means a narrow leaf. One of these represents apparently Mr. Broughton's plant (No. 10 of the list in paragraph 4.*) A vigorous propagation was going on by seed of another form, which was called "*crispa*" by McIvor and Beddome, on what grounds I have no idea. This form has rather acuminate leaves and very large flowers, and is remarkable for the development of a very thick corky outer bark. I saw but one plant, but there are said to be seven or eight in Dodabetta. I also detected two plants of *officinalis* (both broad-leaved) distinctly pubescent beneath.

12. *C. lancifolia*, Mutis.—Though this has been in cultivation from the very commencement of the plantations, very little has been heard of it; and recently it has quite dropped out of notice being no longer included in the annual lists. The few existing trees are the survivors of the numerous descendants of a single plant which was all that was saved out of six brought from Java in 1861. The two or three that I saw were in the lower part of Dodabetta near the Jalap Garden. I was at first inclined to treat them as another form of *officinalis*, but a closer examination has since shown me their distinctness, if not as a species at least as a well-marked variety. The habit and leaves are certainly very like an ordinary *officinalis*, but the calyx shows a marked contraction above the tube, and its free part is sub-campanulate and spreading with rather large triangular sequents; the disk is very thick and prominent, and the corolla large, dark lake and with a broad tube; the large calyx is persistent and crowns the oblong-ovoid capsule. The different calyx seems to separate it from all forms of *officinalis*.† A figure, reduced from the magnificent plate of Karsten's Columbian Flora, will be found in Markham's "Cinchona Species of New Granada" page 53, where is also reprinted a full description. The cultivation of this species is maintained in the Java Government Plantations.

13. *C. micrantha*, R. and P. *and its allies*.—The Grey Barks require no particular notice here. However important a place they may have once occupied in the plantations, they are now practically extinct‡ Isolated specimens can be found on Dodabetta, Naduvatam and Wood plantations, the last survivors of their race. They have died out rapidly: in 1878, close upon 800 trees of *micrantha* were counted on Wood plantation, I saw but one moribund specimen. It is, therefore, unnecessary to make any remarks on their botanical characters; which is somewhat fortunate as these species are very obscure as to their nature and affinities.

14. *C. carabayensis*, Wedd.—(*C. Pahudiana*, How.). Several healthy trees of this pretty but useless species are still growing in the earliest-planted plots at Dodabetta. Its characteristics are quite well known and its interest to Quinologists chiefly historic. Dr. Bidie includes a specimen (No. 36) from Naduvatam in his series.

15. *C. pitayensis*, Wedd.—Of this remarkable species there are some 45 or 50 trees in a clump near "the Jail" at Dodabetta. They are very striking from their habit being so unlike all the other cultivated species; indeed they rather suggest at first a Lauraceous tree or a *Symplocos* than a Cinchona. The species is but little known to botanists, but Howard has given an excellent figure in his "Quinology" t. 12.§ The branches curve strongly downwards for most of their length and then turn upwards suddenly at their ends; here the leaves are crowded, which are stiff, thick and polished, and stand erect with their pointed ends upwards. The trees were past flowering at the time of my visit, and I was unable to examine the corolla, so remarkable for being hairy within; but the young fruit was characteristic enough, crowned with the presistent long, almost setaceous calyx-segments. I was glad to see that some propagation of this species was being undertaken; it appears to have been singularly neglected. It is true we read in the reports of the late Superintendent of 500 planted out in 1872 at Dodabetta and 400 at Hooker plantation and of no less than 4,386 put out in 1874 at the latter‖, but not one of these, I believe, now exists. The tree affords true Pitayo bark; three different varieties were collected by Mr. Cross, and I noticed among the trees some varying slightly from the rest in having shorter and broader leaves.

16. *C. Humboldtiana*, Lamb.—I was enabled to name Colonel Beddome's unknown species, the "celebrated *C. crispa*" of Mr. Cross (see paragraph 6), from my examination of the material in the London herbaria. The original specimens of this species were collected by

* It appears, however, that Broughton's original tree is no longer in existence.

† True *C. Chahuarguera*, R. and P. (not of Howard, which is merely narrow-leaved *officinalis*) is closely allied or intermediate; and *C. macrocalyx*. Pav. (as figured in Wedd., Hist. Quinq. t. 4 bis., fig. A) must also be very near *C. lancifolia*.

‡ The plantations were, however, still credited with the possession of 1874 plants on 31st March 1882 (see Report 1881-82).

§ The figures of *C. corymbosa* and *C. Trianæ* (both referred to *C. pitayensis* by Triana) as reproduced from Karsten in Markham's "Cinchona Species of North Granada", very little resemble the Dodabetta trees as to foliage.

‖ Report for 1873-74, paragraph 3. The plantation books ought to give some details as to the precise plots where these were planted.

Pavon; they are in the British Museum and labelled by him "C. sp. nova de Jaen de Loxa en Quito." The sheets are named by Lambert *C. Humboldtiana*, a name which he published in his Illustrations of the genus Cinchona" in 1821, where, however, his description does not perfectly agree with his specimens. What I consider to be the same species was also collected by Spruce in August 1856, "in Monte Campana prope Tarapoto, Peruviæ orientalis" and is numbered 4832 in that traveller's extensive series of dried specimens. Though Mr. Cross determination of it as "*C. crispa*" may be disregarded, yet that he may have collected the seed is evident from the fact that one of the three dried specimens* he brought back with him is this very species. This is ticketed as follows:—"No. 3, *C. species*. In deep ravines on the Sierra de Campana and Koritroche. This species of Cinchona grows on steep banks of ravines in rather moist situations, it is frequently found in the mountains of Samora which lie eastward from Loxa and is sometimes collected by the wild Indians which traverse that tract of country. This tree grows from 50—60 feet in height, Oct. 18, 1861, R.C." Of this specimen Mr. Markham writes:† "Bark and leaves of *C. lucumæfolia* of Pavon, from Zamora. This is the 'Cascarilla de hoja de lucma' of the natives." He adds, "Mr. Cross made no attempt to collect the seeds as this species is comparatively worthless;" but be that as it may, the plant has clearly reached the Nilgiris.

Colonel Beddome was by no means the first to notice this at Dodabetta.‡ Specimens are included in the series made up by Mr. McIvor § for the India Office in 1873 (see Blue Book V., page 91) where they are numbered 24 and called merely "Corky Bark." I have examined them in the British Museum duplicate set.

*C. Autisii*, Lamb., appears to differ only in the leaves being smooth above, and probably ought to be combined with the present species. To this is to be referred the *C. microphylla* figured in Howard's "Illustrations" t. 17, fig. 1, which plate is a fair representation of the Dodabetta plant with the exception of the slight difference above mentioned. Howard's plate of *C. villosa* (Ill. t. 6) is referred to *C. Humboldtiana* by Triana (and "*C. villosa*, Pav. MSS." is certainly quoted by Lambert), but cannot represent that species.

This plant is clearly a near ally of *C. carabayensis* (*Pahudiana*) and is probably equally valueless; it differs in its smaller calyx, much less conspicuous in fruit, its less hairy capsule, and its smaller thicker leaves which are rounded at the base instead of tapering, and stiffly hairy above as well as beneath even when fully grown; when dried, their margins are strongly recurved. The large development of cork ~~on the bark~~ is probably an accidental circumstance,

17. *Santa Fè Bark.*—The two surviving plants of this valuable Cinchona are both at Dodabetta, one planted out in the lower part of the North-east side, the other still in a pot in the propagating house. They are now 2½ years old, and that planted out is about three feet high only. The few leaves they possess are peculiar and appear to indicate a species quite unknown to me. The figure (fortunately not coloured) in Howard's "Quinology" t. 14 is a very good representation of them. Both Weddell and Triana place the "Calisaya of Santa Fè" under *C. lancifolia* ‖; and, in default of further material for comparison, here it must remain for the present.

18. *Carthagena Bark.*—There are seven plants of this permanently put out at Dodabetta and two at Naduvatam; the latter are the more healthy and the larger is about four feet high. Numerous cuttings are in the propagating houses. There is also a fine plant in Sim's Park at Coonoor.

Of the name of this handsome species I am quite ignorant; it has possibly never yet been defined or named. The leaves of seedlings and young plants are useless for comparisons, being frequently very different from those of adult trees; in these plants they resemble those of *micrantha* more than any other species. The "Hard Carthagena Bark" is usually referred to *C. cordifolia*, Mutis, a variable species with a very wide distribution in South America. Mr. Howard has suggested an affinity with *C. purpurea*, R. and P., which, to judge from the description and his plate (Illustrations t. 11) seems to be probable.

19. *C. robusta.*—In paragraph 5, I have given a sketch of the opinion which prevailed as to the plants I include under the above name, up to the year 1880; and in portions of paragraphs 6, 7 and 8 are detailed the successive views of Mr. Cross, Colonel Beddome, Dr. Bidie, myself and the Kew authorities. I entered on the examination of the Nilgiri trees with no strongly

* These specimens, formerly in the possession of Mr. Markham, were presented by him to Kew Herbarium, February 1882, where I had the pleasure of examining them.

† "Peruvian Bark," p. 238, footnote. I have examined the type specimens of *C. lucumæfolia*, Pav., from Loxa; which is a totally different plant with narrow and perfectly smooth leaves.

‡ Mr. Howard, in a notice of Colonel Beddome's Report (Pharmaceutical Journal, October 1881, page 354), says the plant should be *C. decurrentifolia*, Pav.

§ It is doubtless the plant alluded to by Mr. McIvor in his Report for 1869-70 (paragraph 5). "Among our Crown barks we have this year discovered a very interesting and apparently a new species with soft downy leaves and a rough corky bark, but deficent in alkaloid. This plant was raised from the original seeds introduced by Mr. Cross through Mr. Markham, and must have been gathered by accident" (Blue Book V, page 6).

‖ I am unable here to refer to Mr. Howard's paper in the Bull. Soc. Bot. France, Vol. XXII, on *C. lancifolia* var. *oblonga* referring to this plant.



settled opinion as to their nature, though my Ceylon experience had more and more inclined me to look upon them as hybrid forms rather than as one or more autonomous species.

I found the forms presented to be ~~quite~~ those so common in Ceylon plantations. Generally robust well-grown trees, larger, hardier and healthier than either the *officinalis* or *succirubra* among which they were scattered and often flourishing where neither of them can thrive. Botanically, there was ~~just~~ the same range of variety, the extreme form in one direction, with its dark green smooth shining leaves, closely approaching some of the large-leafed forms of *C. officinalis*, and that in the other direction with its large pale thinner leaves more or less pubescent beneath, so close to the hairy form of *C. succirubra* as to be often with difficulty distinguished from it. Between these, as regards color and pubescence, were many intermediates, though undoubtedly, with a little ingenuity, the whole can be thrown into the two groups. There are not many on Dodabetta (where are no *succirubra*), and these are nearly all of the glabrous sort, but on Naduvatam they are much more numerous, and in parts both there and at Hooker plantation they stand out conspicuously above the more or less sickly and stunted kinds round them.

As the chief of the test-points as to origin was the alleged occurrence of a few "in the oldest plots" at Naduvatam, I particularly examined several. They are certainly growing in plot No. 1, planted in 1862, and are of both the glabrous and pubescent kinds.* They are also undoubtedly old trees, but that they form really a part of the 1862 *planting* cannot, I think, be affirmed with certainty. From the look alone I do not think it possible to say whether a ~~gum~~ tree be twenty years old or sixteen; it is therefore necessary, in the present case, to see whether there are any grounds for supposing that the *robusta* trees may have been supplies put in to fill up vacancies in the original planting. With one tree this appeared to be the case, as it was clearly out of the line, but in two others there was certainly nothing in the surroundings to suggest that they were not part of the same planting as those around them. But the question is of such importance that it requires further examination.

*C. succirubra* first flowered in 1863,† but I have no evidence that *C. officinalis* did so before 1865. In that year, however, both ~~trees~~ ripened seed, and in the next the majority of the young plants were being raised from seed.‡ We have it on Mr. McIvor's authority that "in 1866 a number of hybrid seedlings were produced" and that "the selected varieties were planted here and there in every way, soil, exposure, and elevation available."§ In the year, 1866, six hundred of the ~~first plants~~, planted out in August and September 1862, were cut down for their bark;‖ and though nothing is said as to the filling up of the gaps thus caused, this was certainly done, as is evident from the regularity of the existing plots. It is ~~very~~ likely to have been effected with the new seedlings; two or three years later, Mr. McIvor expressly states that "all the supplies are plants raised from seed."¶ What therefore more probable than that some of these "hybrid seedlings," which were planted "in every way available," should find their way into the 1862 plantations along with the other supplies in 1866-67.

One of the trees pointed out to me in this 1862 plot was one of those hybrids denounced by Mr. Broughton (31st July 1871) as "combining the bad qualities of both their parents."** Now, he could scarcely have called this tree a hybrid if he had not good grounds for believing that it was no part of the original 1862 plantation in which it grew; indeed he states definitively (13th February 1873) that the hybrids "appear only among seedlings, *there being none among the original trees.*"†† I may add that in this same "1862" plot there are several trees of *Calisaya* which cannot be any part of the first planting.

A search through the late Superintendent's papers and the plantation records might very probably give much information as to this and other historical matters. He has stated that he always reckoned 30 per cent. of every year's planting as failures to be subsequently filled by supplies, a fact which the recent compilers of statistics of the plots seem to have scarcely fully realized.

These remarks may be considered a sufficient answer to the first of Dr. Bidie's arguments (see para. 8). I will now proceed to discuss the remainder of them.

20. *Mr. Cross' credibility.*—Dr. Bidie thinks Mr. Cross' positive statement that he sent plants of "Pata de Gallinazo" to India to be probably true. To my mind I must say that "probability" points rather the other way. Dr. Bidie has himself remarked on the "little reliance" that can be placed on that traveller's memory, and indeed we have abundant evidence of its treacherous character. It has made him give two different accounts of this very matter, caused him to forget well-known facts and make unfounded statements about Dr. Spruce, hopelessly confused him over the distinctions between *succirubra* and *micrantha*, and supplied him

* Nos. 2, 3, and 4 of Dr. Bidie's set.

† Kew report for 1863; Journ. Bot., 1863, p. 254.

‡ McIvor, Reports, 1864-65 and 1865-66, para. 4.

§ *Id.*, Report, 2nd August 1875. Mr. McIvor believed these to be the result of his experiments in artificial cross-fertilization; it may be so, but it is perhaps more probable that they arose naturally. In either case they appeared.

‖ McIvor, Report for 1866-67, para. 2. This important fact seems to have been overlooked by subsequent writers.

¶ McIvor, Report, 1869-70.

** This particular tree is a glabrous *robusta* with the leaf more elongated than usual. Colonel Beddome considered it "glabrous *pubescens*."

†† Letter to Howard, printed in his "Quinology," p. 113. The italics are my own.

with a totally erroneous name for the plant, "No. 3" of his collection, now shown to be *C. Humboldtiana*. These reminiscences indeed seem singularly confused, and I do not consider it necessary to further allude to them.

21. *Alleged stability of type.*—Another point urged by Dr. Bidie (*d*) in favor of the autonomous nature of this plant is, as he thinks, the want of a decided tendency, "as in the case of hybrids," to vary more than is usual in other undoubted species of *Cinchona*. I need scarcely remind Dr. Bidie that cultivated plants supply us with abundant examples of known hybrids as permanent as most species; but as regards *C. robusta* our experience in Ceylon is very different. It is notorious that the seed is most uncertain, and it is well known that Mr. McIvor would not trust it. On his visit to Ceylon in 1875-76 he gave seed of his best "*pubescens*" to several careful planters here; the result in one case was 10 per cent. like the parent, and the remainder varieties of *succirubra* and *officinalis*; and this has been the so general experience here that I am indeed surprised to read of a different state of things in the Nilgiris. In Darjiling Dr. King states that "about half" the plants from seed come up "officinalis."* Colonel Beddome could not deny these facts, but tried to explain them by careless collection of seed, but I know of cases where this source of fallacy was most carefully guarded against with no difference in the result. Colonel Beddome himself must at the last have had doubts, for he allows that it is better to grow the plant from cuttings.† It is indeed this reversion to apparently parent forms that is one of the chief reasons for regarding *robusta* as a hybrid.

But we have more direct testimony of its origin. I am assured by planters of credit that they have grown both glabrous and pubescent *robusta* from seed of ordinary *officinalis*, and that it is by no means unfrequent for seedlings of them to appear in seed-beds on estates where no trees but *officinalis* and *succirubra* occur. I have myself seen seedlings of *robusta* self-sown where there are no parent trees of the sort whence they could have been derived; and at one time I was inclined to regard it as a variety of *officinalis*. There are, I think, grounds for believing that *succirubra* generally supplies the pollen and is therefore the male parent, both in the case of *robusta* (succirubra and officinalis) and *anglica* (succirubra and calisaya). I do not attach any great importance to bark-chemistry alone as a botanical character, but it may be noticed, as bearing on the derivation of these trees, that the analyses of their barks (though very variable) combines as a rule the characteristics of both Red and Crown barks.

22. *"Pata de Gallinazo" and "Cuchicara" Barks—C. erythrantha*, Pav.—The two remaining arguments advanced by Dr. Bidie become of less importance in face of what has now been stated. The specimens of "Cuchicara" and "Pata de Gallinazo" collected by Spruce ‡ are no doubt imperfect ones; they have, however, proved sufficient for one of the most careful of botanists, M. Triana, to identify them with *C. erythrantha*, Pav.,§ to which Messrs. Spruce and Howard had also, with doubt, referred them. The flowers of the more pubescent specimen of the "Cuchicara" are described by Spruce on his ticket as "deep brick red," a tint I have never seen in any Cinchona flower in the East. The leaves of all his three specimens are more or less pubescent. Dr. Bidie rather begs the question when he argues that the fact of the imperfection of these specimens is in favor of the Nilgiri plants being the same, and then proceeds to remark what an "extraordinary coincidence" it would be that two hybrids approaching so closely these wild South American plants should arise in the Nilgiris. It is not admitted that these *robusta* forms *do* approach Spruce's specimens very closely; on the contrary such eminent botanists as Sir J. Hooker, Prof. Oliver, and Mr. Thiselton Dyer express themselves strongly to the contrary effect. The wider tube of the corolla in the "Cuchicara," which is obvious, the color of the flower, and the character of the inflorescence are good distinctions ‖

On a review of the whole question then I am of opinion that the additional evidence derived from an inspection of these forms of Cinchona in the Nilgiri plantations does not by any means prove the improbability—still less the impossibility—of their being, as so long believed, hybrids of local origin between *officinalis* and *succirubra*, which opinion is, on the contrary, supported by a large number of facts of observation and warrantable inference.

23. *Uniformity desirable.*—In conclusion I wish to add a plea for uniformity in nomenclature. It is very much to be desired that the same plants should bear the same names in India and Ceylon and elsewhere, and that obsolete, incorrect, or duplicate names should be abandoned. No less than three different Cinchonas are called "*crispa*" at Dodabetta; it is rightly applied but to one, and that is so ill-defined that the name might well be dropped altogether. The various denominations bestowed on the hybrids may be entirely dispensed with as incorrect or

* In his Report of the Bengal Cinchona Cultivation for 1881-82 Dr. King distinguishes "six distinct forms" of these *robusta* hybrids.

† Beddome, Report on the Sikkim Plantations.

‡ It should be remembered that these were collected in 1859, before Dr. Spruce was employed by the Indian Government or Mr. Cross was engaged.

§ C. *erythrantha* is figured in Howard, Illust. t. 12. It is considered the same as *C. pubescens*, Vahl. by Triana. The descriptions (but not the figures) in the same work of the following are also referred by M. Triana to *C. pubescens*, Vahl.; *C. coccinea*, How.; *C. Palaiba*, How.; *C. subcordata*, Pav.; and *C. suberosa*, Pav.

‖ I may add with advantage that in my careful search through the public herbaria of London I did not find any Cinchona from South America agreeing with either of the leading forms of *robusta*.



misleading; *magnifolia*, pata, cuchicara, *pubescens*, *villosa*, &c. The glabrous and pubescent forms are now allowed on all hands to be of similar nature, and a single name is sufficient. Those who are convinced of their hybrid character may use the descriptive title *succirubra-officinalis*, or the shorter name *robusta*, whilst those who still think them an autonomous species of South America are bound to call them *C. erythrantha*. Of course I am not speaking of *barks*; planters and merchants may give these what names they require in the vernacular, but with these names the botanist, as a botanist, has nothing to do.

The only other remark I have to make is to suggest whether the time has not now arrived when the Madras Government might adopt the spelling of this genus of plants followed by scientific men. So far as I am aware, there is not one living botanist who writes it in any other way than *Cinchona*. The matter is a purely technical one; systematists have long ago decided on the rules governing such cases of nomenclature, and the present one is not to be regarded as a subject for discussion. Were it permitted to amend the Latin genera which do not happen to agree precisely in spelling with names (it may be Russian, Hungarian, or Japanese) of the persons whom they are intended to commemorate, many besides *Cinchona* would have to be altered. But it is not so permitted.

## PART II.—PRACTICAL SUGGESTIONS.

24. I have now concluded the remarks I have to make with regard to the botany of the Cinchona plantations, the subject upon which I was requested to report. But I have reason to believe that some observations upon the principles which ought to regulate, in my opinion, the future management of this fine State property will be acceptable to the Government. I take it for granted that the recent appointment of Mr. Lawson, of Oxford, to the office of Superintendent is evidence of a desire to maintain the plantations in a high state of efficiency.

25. *Management for past six years.*—It is to be feared that on the whole, during the last few years, the conduct of the estates has not been altogether satisfactory. They have been managed too much with a view to revenue, and without that constant care and oversight which was (at any rate for many years) bestowed by the late Superintendent. I consider that both the plantations and the trees have been overworked. Though many trees which have been frequently barked on Naduvatam and Hooker still appear healthy and cannot be said to have been much hindered in growth, yet, owing to the very imperfect renewal of bark—only in short strips or patches—it is now impossible to get any good samples or to practise the shaving method. I think that very many more trees should have been left untouched; we have yet to learn the effect of removing the bark upon the longevity of the trees and the real life-history of Cinchona in the East.* The recent supplies or renewals do not appear to have been very successful, the number of failures being very large.* No vigorous attempts towards increasing the specially valuable sorts or the recent introductions have been made; even the Pitayo barks—obtained at such cost and trouble, and specially recommended in 1878 by Government for further cultivation—remain little more than curiosities, and no effort to propagate the valuable Santa Fè has been made since Mr. Cross' departure.† Selection by cuttings or seed from the best of known analyzed trees (by which system, steadily persisted in, the Dutch in Java have so largely increased the value of their bark) has not been practised, nor is propagation of the delicate sorts by grafting on more hardy varieties carried on. I know from experience that seed has not always been carefully collected, and that there has been a good deal of confusion between "*pubescens*" and *succirubra*.

26. *Necessity for a good propagator.*—Under a new *regime* we may expect to see attention paid to these things as well as to experiments in artificial hybridization ‡ and its results, the effects on longevity and health of the processes of stripping and shaving respectively, &c. I venture, however, to suggest that the assistance of a skilful propagator being necessary, such an addition to the staff of the Superintendent may be made.

27. *A scientific culture the object for the future.*—Progress in knowledge and improvement in practice, and not gain, should be the main objects of Government in the management of their plantations. I do not forget that the ultimate end of the enterprise is the production of a cheap and efficient febrifuge for India and the East. But this great purpose will be in no way retarded by the course recommended; on the contrary, as all that adds to our knowledge of bark-cultivation will lead to the increase of private plantations and their successful and profitable culture, it must be forwarded and hastened. The subject is somewhat complicated by various other considerations; but probably the final realization of that grand and beneficent scheme is

* In the three official years 1878—81 no less than 33,407 red barks have died upon Hooker Estate alone (Beddome's Report, Appendix B); and I understand that the mortality of crown barks put in since has reached as much as 80 per cent.

† *C. lancifolia* (paragraph 14) should also be propagated. The latest analyses of this in Java (Moens' Report, 20th February 1883) show total alkaloids varying from 4·6 to 7·2 per cent., of which quinine is from 1·1 to 2·0. Though less valuable than *officinalis*, this species is rather better than the majority of the Java *Calisaya*.

‡ This subject was specially insisted upon in the Report of the Cinchona Commission of 1878.

more likely to be immediately effected by private enterprise in Europe or in India itself than by any ~~local~~ Government manufacture of alkaloids. Humanity will be equally benefited in the one case as the other. For the present this subject, however, may be allowed to rest.* Meanwhile the Government possesses a very valuable property, which, worked without stinting the expenses necessary for the highest experimental cultivation, cannot fail to return a profit for many years to come. More than twenty years ago the Home Government very justly remarked (Despatch, Secretary of State, Jan. 1863) that the Cinchona experiment could not be regarded as a mere money speculation, "nor are the commercial advantages that may be derived from it to be considered as other than a secondary consideration, though of course a return for the outlay and the spread of Cinchona cultivation by private enterprise are very desirable in themselves." How little, when these words were penned, could the present financial success have been imagined, and with how much more force do they now come, when even the outlay itself has been more than repaid, and a large and enterprising class of private ~~genus~~ of bark is in existence.

28. *Necessity of a Quinologist.*—The recent appointment is a step forward, but for any satisfactory progress to be made the chemist as well as the experimental physiologist and botanist is a necessity. For it must be remembered that it is *alkaloids* we want to grow, not bark only, and the cultural Superintendent is likely to be able to give us little accurate information about them. Further, the chemist must be on the spot, among the trees constantly, and always in readiness to work in unison with the Superintendent as one man at jointly-planned investigations. I desire to press this strongly, as the vast importance of constant analyses does not appear to have been realized by the members of the Commission of 1878, nor at first by Colonel Beddome.†

The Madras Government in supplying this deficiency will, in fact, be merely taking up again the work which was unfortunately dropped some eight years ago on the sudden resignation and disappearance of Mr. Broughton. The value of this chemist's researches is unquestioned, and his results are constantly quoted and acted upon. But his work was left quite unfinished, and it is to be feared that he got but scant assistance from the late Superintendent. He worked, too, a good deal in the dark as to the names and nature of the trees which were then very unsettled. Since his time this has been changed, and chemists have also given us a great mass of facts as to the chemical composition of the barks of all the cultivated kinds, the main characteristics and general relative value of which in the market are now quite well understood. But there are many questions of the greatest value to cultivators still pressing for solution. The range of difference in the proportions and quantities of the alkaloids in barks from trees of *identical botanical type* is very large, and the same is true of the plants raised from seed of a single tree. We know nothing of the causes of these *individual* differences. There is even variation in analysis of bark raised from cuttings of one and the same tree; yet it has been shown ‡ that the stock has no influence on the alkaloids ~~of~~ grafted shoots. It is thus clear that in the production of alkaloids the inherited nature of the trees is largely influenced by certain surrounding conditions, and these it is most important we should discover. The apparently good results which Mr. Broughton obtained from experimental manuring have never yet been corroborated or disproved. Even the cause of the increase of alkaloids in renewed bark is but little understood, and we probably are unable to avail ourselves of the fact to the full extent. The influence of age on alkaloidal composition in the various species is only guessed at from experience, but no series of analyses of selected trees at frequent intervals from the commencement of their lives onwards is available. These are samples of the investigations which only an analyst resident on the spot and working with the Superintendent can hope to decide.

29. *Position of the Government of Madras.*—All such researches however can only be properly carried on in a Government establishment, where the officers can devote themselves in a spirit of pure research to a work which must, of necessity, be spread over many years. And I will add that it is to the Government of Madras that all who are interested in Cinchona in any of its various aspects necessarily look to take the lead. No other Government, in fact, will be likely to undertake it. In Bengal, the production of febrifuge at present engages the whole attention of the staff, whilst here, in Ceylon, the Government possesses no plantations and is in no position to expend public money without an ~~evident and quick~~ return. It is true that from Mr. Moens in Java we have learnt much, but even there the object has ever been revenue, and we ought not, and need not, to be dependent upon what a foreign Government may please to make public. On the other hand it was Madras that was formerly in the front position. As the pioneer of Cinchona-growing in India it proved that the best barks could be grown there, and initiated a great industry. This it did as an experiment and with a judicious liberality at

* It has been thoroughly discussed in the Report of the Cinchona Commission of 1878, pp. 2—11, and with their opinions on the matter I generally agree.

† The latter however, after his visit to Ceylon, completely changed his views, and has expressed the opinion that the analyst is "all important." This opinion has been commended by Government to the Secretary of State (G.O., No. 1513, 13th October 1881.)

‡ Report for first quarter of 1883 of the Java Cinchona Enterprise.



immense cost. The excellent system followed has, from fortuitous circumstances, come to an end; under the very favorable present conditions, one cannot but expect to see it revived.

30. *Selection by Analysis.*—To go into any details of cultivation would be out of place here, but I may express the conviction that, in the present state of our knowledge, the most promising direction for the improvement of the trees as alkaloid-yielders is *selection based on analysis*. This is to be effected by the isolation of trees with high analysis, precautions to prevent cross-fertilization, care in collecting seed, analysis of a selection of the resulting plants, destruction of all that do not reach the standard of their parent, again isolation of the best trees; and so on for several generations. The same principle may be more readily applied to grafts and cuttings. It is clear that in such a cultivation it is the chemist who regulates the procedure: plants which his analyses condemn are ruthlessly destroyed, those which answer his test are preserved to become the parents of improved successors.

31. *Changes required.*—The desirability of a plantation at a lower elevation and with a more equable rainfall has been already recognized by Government (G.O., No. 1280, 29th August 1881). Neither *C. Ledgeriana* nor any of the varieties of *C. Calisaya* (of which there is good reason to believe there are some valuable sorts not yet in cultivation) succeed on the existing estates.* A site should be selected at about 3,500—4,000 feet in sheltered forest land. In some estates in such situations in Ceylon *C. Ledgeriana* is doing very well, and has more than equalled the Java trees in alkaloidal yield.

On the other hand the utility of keeping up the Hooker and Wood plantations might be again considered. They have been obviously much neglected, and I see no advantage to be derived from their maintenance beyond the profit from bark sales.

32. *Arrangement of Records and Publication of Results.*—The only other suggestion I have to offer is perhaps scarcely required. It is that all the records, papers, notes, and orders connected with the Government plantations be brought together and properly arranged and classified, so as to be readily available for reference. There must be much in Mr. McIvor's papers supplementary to his rather meagre annual reports, and probably Mr. Broughton's notes would repay perusal. At all events the history of the plantations cannot be followed without ready access to all the records. For the future Government should take care that accurate note is kept of all work done in the plantation plots (as to deaths, supplies, renewals, and harvesting operations) as well as in the experimental houses and nurseries and in the laboratory. I will conclude by expressing the opinion that all results should be made promptly available to the public in annual reports, which also ought to be easily obtainable.

(Signed) HENRY TRIMEN.

* The *Calisaya*-forms hitherto introduced make very bad growth and are short-lived. They are also poor quinine-yielders. Of the fifteen barks of this kind selected by Dr. Bidie for analysis, only two afforded over 3 per cent. of that alkaloid (one, No. 14, gave 5·55), whilst one (No. 21) gave only a trace, and all showed a strong tendency to develop the least desirable of the alkaloids—cinchonine (as much as 4·40 in No. 17). Some may be tried at the lower elevation, but experience in Ceylon is not favorable to their cultivation.

GOVERNMENT OF MADRAS.

## REVENUE DEPARTMENT.

READ—the following letter from Dr. H. TRIMEN, Director, Royal Botanical Gardens, Ceylon, to the Secretary to Government, Revenue Department, dated Peradeniya, 30th June 1883:—

ABSTRACT.—Forwarding his Report on the Government Cinchona Plantations on the Nilgiris.

ENCLOSURE.

From Dr. H. TRIMEN, Director, Royal Botanical Gardens, Ceylon, to the Secretary to Government, Revenue Department, dated Peradeniya, 30th June 1883.

I have the honor to forward to you my Report on the Cinchona Plantations of the Nilgiris, which I have divided into two portions.

PART I—*Botanical Observations.*—In accordance with the invitation conveyed to me on 10th April that I would "inspect and report upon the Botanical problems presented by the Nilgiri Cinchona Plantations," I proceeded, with the sanction of this Government, to Madras, and reached Ootacamund on May 5th. During the succeeding fortnight I investigated the plantations at Dodabetta, Naduvatam and the Pykara river. Throughout the examination I was so fortunate as to have the company of Dr. Bidie—who has an intimate knowledge of the plantations—and of my old friend Mr. Lawson, who has lately been appointed Superintendent of them;* at Naduvatam we were joined by Major Campbell Walker, Conservator of Forests, Mr. Gass, Deputy Conservator of Forests, under whose charge the plantations actually were; and Mr. Lorne Campbell, a Member of the Cinchona Committee of 1878.

2. *Previous Preparation.*—In addition to a somewhat critical study of *Cinchona* made during my connection with the British Museum, and the facilities I have since enjoyed in Ceylon from an acquaintance with the cultivated kinds, I may add that during a visit home last year, I took the opportunity of renewing my acquaintance with the dried collections, both at Kew and the British Museum. At the former establishment, I paid special attention to the original specimens sent home from the Andes by Spruce and Cross and to Colonel Beddome's and Mr. Bidie's recently received series from these plantations; whilst at the Museum I re-examined chiefly the original type-specimens of Pavon, and a fine numbered set collected in the Nilgiri plantations themselves by the late Mr. McIvor in 1873, and presented by the Secretary of State for India.

3. *Botany of Cinchona in general.*—So many persons have reported upon the botany of the trees under review that they possess quite a small literature of their own, and it might be supposed that the subject was thoroughly exhausted. In past times Mr. Markham, the late Mr. McIvor, and especially Mr. Howard, and more recently Colonel Beddome, Mr. Cross and Dr. Bidie have paid particular attention to the troublesome questions connected with the nomenclature of the several kinds. With regard to some of these writers, I trust I am in no way forgetful of the many and great services that they have rendered to the Cinchona enterprise when I feel bound to say that from the botanical point of view, I think it is much to be regretted that circumstances should have thrown this very difficult genus into the hands of those who have had so little of the requisite training and experience in systematic botany for dealing with it effectively. It ought indeed to be generally understood, that however eminent a writer may be as a quinologist, a traveller, or a gardener, if he can see important botanical characters in the height of a tree, the chemical constitution of its bark, or the colour if its leaves, he is *ipso facto* disqualified to pronounce on questions of classification. A number of published names have, however, been defined by nothing more than some such botanically trifling or variable distinctions, and should not be recognised until properly characterized. There is nothing about the genus *Cinchona* in its botanical aspects to warrant it being treated on any principles different from those which the systematist is ordinarily accustomed to employ: for authors, who know little of those principles or have had no experience in the application of them to other groups of plants, to attempt to arrange the forms of so involved and complicated a genus as this can only lead to failure and confusion.

* At the time of my visit, Mr. Lawson had not been actually placed in charge.

It may be said that botanists themselves disagree largely on such points: their differences, however, appear greater than they really are. There is rarely any serious disagreement as to the relative value of characters, though there is much as to the *grade* which the individuals or groups defined by them should occupy. Thus a group which one naturalist will consider as a single species with several varieties will be four or five species to another; or a small set of allied species or a single isolated one may be regarded as a distinct genus by one botanist, and be relegated to some larger one by another. Such differences there must always be, for they represent the more or less synthetical or analytical bent of individual minds, but naturalists have long left off discussions over such matters, which, indeed, since the general recognition of affinity by descent, have lost entirely the significance they once had.

We possess, however, arrangements of the whole known species of *Cinchona*—worked out simultaneously but quite independently—at the hands of two eminent botanists both familiar with South America and the wild trees; the late M. Weddell of Paris and M. Triana of New Granada, * and it is to these works and especially to that of M Triana that we have to go in the endeavour to find sound views as to the limits of the species (which are nearly all of extreme variability) and their correct nomenclature. Unfortunately in neither treatise are descriptions given; I venture to think that had M. Triana attempted to accurately define his thirty-six species he would have considerably reduced their number. Too many are still little more than varieties of *barks* distinguishable by the collectors or by merchants, and do not represent *plants* with such a combination of anatomical characteristics as are necessary to constitute a recognizable species.

4. *The kinds in cultivation in the Nilgiris.*—The now well-known story of the successive importation of different sorts of Cinchona from South America to the Nilgiris is told in official detail in the five blue-books (issued from 1863 to 1867) so far as to the middle of 1875, and has been briefly summarized in Major Campbell Walker's excellent report of 1878. It is much to be regretted that the late Superintendent's reports are so meagre in detail as to render it impossible from them, to trace with any minuteness the history of the kinds which thus came under his charge. The latest to which I have access is dated 31st July 1875 † and professes to give the botanical names and numbers of the plants of each "species" then cultivated. I need say nothing here about the numbers given; they have been since shown to be exaggerated to an almost incredible extent; but as to the names, the twelve kinds given were no doubt generally at that time distinguished in the plantations.

1. C. succirubra ... Red Bark.
2. C. calisaya. ... var. Putex } Yellow Bark.
   Do. ... var. Vera }
   Do.
3. C. officinalis ... var. Condaminea, original Loxa Bark.
   Do. ... var. Bonplandiana, select Crown Bark.
   Do. ... var. Crispa, fine Crown Bark.
4. C. lancifolia ... Pitayo Bark.
5. C. nitida ... Genuine grey Bark.
6. C. species without name Fine grey Bark.
7. C. micrantha ... Grey Bark.
8. C. peruviana ... Finest grey Bark.
9. C. Pahudiana. Finest grey Bark.
10. C. lanceolata-leaved variety of C. officinalis.
11. C. Pitayo, raised from imported seed.
12. Do. Plants brought out by S. Simpson.

The nomenclature of the first nine kinds dates from Mr. McIvor's first report, 31st May 1862, but some changes had been made since that date. At that time *C. officinalis* was collectively called "*C. condaminea*" and the three varieties were respectively "var. *Uritasinga*," "var. *Chalmanguera*" and "var. *Crespilla.*" No. 4 was then said to afford "Crown bark" (not Pitayo bark) and No. 9 at first went under the name of *C. lucumæfolia* of the Dutch. Nos. 9 and 10 first appear in the returns for July 1869. No. 10 was the tree observed by Mr. Broughton in 1868 to be so rich in quinine, and provisionally called by him ‡ "var. *lanceolata*," which name was in 1872 altered, in accordance with Weddell's nomenclature, to var. *Augustifolia*. The last, No. 12, was added in January 1871.

As a correct chronology is important it will be well to give, for easy consultation, the sources and date of reception of these various kinds which composed the plantations of July 1875.

* H. A. Weddell, Notes sur les Quinquinas; in ann. des Sc. Nat., Botanique, ser. 5, XI, page 346, and XII, page 24, (1869).
J. Triana, Nouvelles Etudes sur les Quinquinas, Paris, 1870 [1872].
† Blue Book V, page 189.
‡ Blue Book III, page 237.



| | | | | |
|---|---|---|---|---|
| 1. | *C. succirubra.* | Seeds, South America, Spruce. | February | 1861. |
| | | Plants, South America, Cross. | April | 1861. |
| 2. | *C. calisaya.* | Plants, South America, Cross. | April | 1861. |
| | | Plants, Java (originally collected in South America by Hasskail in 1854), T. Anderson. | December | 1861. |
| | | Seeds, South America, Markham. | " | 1865. |
| | | Seeds, Mr. Money (? Including *C. Ledgeriana*). | " | 1865. |
| | | Plants, Kew (originally from seeds collected in South America by Weddell) "*Josephiana, glabra.*" | " | 1866. |
| | | Plant, J. E. Howard, "superior variety." | " | 1867. |
| 3. | *C. officinalis.* | Plant, J. E. Howard (from seed collected by Don Riofrio in South America). "*Uritusinga.*" | April | 1862. |
| | | Seeds, South America, Cross. | February and March | 1862. |
| 4. | *C. lancifolia.* | Plants, Java (seeds originally collected in South America by Karsten), T. Anderson. | December | 1861. |
| 5. | *C. nitida.* | | | |
| 6. | *C.* species without name. | Seeds, South America, Pritchett. | January | 1861. |
| 7. | *C. micrantha.* | | | |
| 8. | *C. peruviana.* | | | |
| 9. | *C. Pahudiana.* | Plants, Java (originally collected in South America by Hasskail in 1854), T. Anderson. | December | 1861. |
| 10. | Found among progeny of No. 3. | | | 1869. |
| 11. | *C. Pitayo.* | Seed, South America, Cross. | | |
| 12. | —— | Plants, brought by Dr. Simpson from England. | " | 1870. |

Since the date of this Report the principal new sorts that have been brought into the plantations are the New Granadan (Columbian) Bark-trees. Mr. Cross arrived at Ootacamund on 8th October 1880 with three plants of *Santa Fe* (Soft Columbian) and six of *Carthagena* (Hard Columbian) which he had himself collected in South America. Probably seeds or plants of *C. Ledgeriana* for the Government Plantation in Java were also received in 1872—1875 or thereabout, but I find no record of their reception. Quite recently, in March 1883, seed of varieties of *Calisaya* stated to be the "verde" and "morada" of Bolivia have been purchased from a London firm and numerous seedlings have been raised.

5. *The Hybrids; "pubescens" and "magnifolia."*—Mr. McIvor died in June 1876, and up to the arrival of Mr. Cross as above noted, the names in the list given in the last paragraph were generally recognised and used. In addition however to these, the two names at the head of this paragraph were also commonly employed to designate trees which it was believed resulted from the crossing of *C. officinalis and C. succirubra.* These were first brought prominently into notice by Mr. Broughton in 1869;* Mr. McIvor, in his report for 1869-70, also remarks on the readiness with which hybridization occurs and states that some "very interesting hybrid varieties" had been raised from seed. The name "*pubescens*" dates from 1872 when it was bestowed as a varietal (hybrid) name by Mr. Howard † on a plant, the bark of which afforded him a very high percentage of alkaloids; that of "*magnifolia*" seems to have arisen from a faulty identification of the leaves with the plate of *C. magnifolia*, Pav. in Howard's "Illustrations" ‡ by Mr. McIvor. The hybrid nature of these plants remained unquestioned, and their rapid increase led Mr. Howard to write in 1876: § "it seems difficult now to obtain seed from Ootacamund that is not hybridized." Dr. Bidie also in 1878 ‖ was much struck with the strange tendency of the species to cross and says of the "hybrid called *C. pubescens*" that "specimens submitted to Dr. King and myself.....show that it is a hybrid with a strong strain of the *officinalis* family, and apparently a cross between *C. officinalis* and *C. succirubra.*"

Similar experience was recorded as early as 1870 from Sikkim, Ceylon and Java, and up to the end of 1880 there was a general consensus of opinion as to the probable origin of the plants.

* Blue Book III, 239: V, 48, and Journ. Linn. Soc., XI, 475.
† Journ, Linn, Soc., XIV, 160.
‡ Tab. 13. This represents a number of a different genus, *Cascarilla*, now *Cascarilla magnifolia*, Wedd.
§ Quinol. Ind. Plants., p. 84.
‖ Appendix to Rep. of Cinch. Committee p.p. 42-45.

6. *Mr. Cross's and Colonel Beddome's opinions.*—In January 1881, Mr. Cross sent in a report on the plantations, which was printed in the following June. Early in the same year, the plantations having been transferred to the Forest Department, the Conservator, Colonel Beddome, was directed to inspect and report upon them. The valuable notes he prepared in June, together with further observations by himself and by Mr. Cross in August, were printed in September, and as the botanical points in dispute have mainly arisen on the opinions expressed in their documents, it is necessary to give them particular attention. This is especially due to Colonel Beddome, who has a well-merited reputation as a skilful field botanist: as Mr. Cross was the original collector of most of the kinds, and familiar with them in the wild state in their native localities, he would also seem to have claims to a hearing.

The principal point insisted on by the latter in his Report refers to the hybrid form called "pubescens." This he says is really a "narrow-leaved variety of red bark" and was called "Pata de Gallinazo" by the bark-collectors in South America. He could not see in it "a particle of the characteristics" of *C. officinalis*, and he observes that the trees may be found at Naduvatam "not unfrequently among the first-planted trees there." We further informed Colonel Beddome that he himself sent *seeds* of this "Pata de Gallinazo" to the Nilgiris at the same time as *succirubra*, but not separate from that species; in a letter to Colonel Beddome, however, dated 10th August 1881,* he gives a very different account of the mode of its introduction, in which he states that he obtained *plants* in the bottom of a ravine on Chimborazo to fill up one of the packages of *succirubra*, and that his companions, two lads, the sons of a bark-collector, identified them at once as Pata de Gallinazo. He also calls it "a new and undescribed species."

All this was absolutely new to everybody; for not a hint of anything of the sort is to be met with in any of the voluminous reports or papers referring to the collection of the Bark-trees for India. Colonel Beddome, however, was quite convinced of the accuracy of Mr. Cross's recollections, and supported his assertions. He, too, could see in the plants none of the characteristics of a hybrid, and considered that they had evidently been in the plantations from their commencement.

Cross afterwards restricted his previous remarks to "*magnifolia*" only, and said that "*pubescens*" was a different species from "Pata de Gallinazo;" after some further consideration, he pronounced that "*pubescens*" was the real *C. succirubra* and that the plant, hitherto grown under that name, was not that species but *C. micrantha*, or some other grey bark! Colonel Beddome, however, recognized varieties of a single species only in "*magnifolia*" and "*pubescens*," and this, he thought, quite distinct from both *C. succirubra* and *C. officinalis*. With regard to the supposed numerous varieties of *C. officinalis* neither Colonel Beddome nor Mr. Cross could trace them out. The former speaks somewhat doubtfully as to the nature of what passes as "*Uritusinga*" on Dodabetta, of which he believes there are about 1,000 there and about 12 at Naduvatam. As to *C. calisaya*, he could distinguish four varieties, ordinary "*Calisaya*," "*Ledgeriana*," "*anglica*" and "*javanica*."

A paragraph (45) is devoted by Colonel Beddome to an "unknown species" with very rough corky bark and leaves hairy on both sides, of which five trees were found on Dodabetta. Mr. Cross at once pronounced this to be "the celebrated *C. crispa* of the Loxa mountains, a packet of the seed of which we collected when collecting the *officinalis*;" he added that it gives a very valuable bark and that he sent the seed to Mr. McIvor who told him that it never germinated.

Mr. Cross sent home thirty samples of bark for analysis by Messrs. Howard. In his remarks accompanying No. 18 ("Pata de Gallinazo") Mr. J. E. Howard—who also seems to have fully accepted Mr. Cross's statements—says† that it is *C. coccinea* of Pavon‡ and not red bark at all. In abandoning his former view of the hybrid nature of "*pubescens*" Mr. Howard merely says it is one of the "cognate species to *succirubra*."

Colonel Beddome collected and dried good typical specimens of the 18 different kinds of *Cinchona* he could recognize, and these were forwarded to Kew with the object especially of the "Pata" (No. 2), "pubescens" (No. 3) and the "unknown species" (No. 18) being there identified.

7. *My own views and those of the Kew botanists.*—In September of the same year, I had the pleasure of receiving Colonel Beddome during his short visit to Ceylon. He found on the estates here abundance of Cross's "Pata," and some of the Nilgiri "pubescens." In his report to Government, dated 3rd October (No. 167), by some strange misapprehension, he quoted me as supporting his views as to the nature of these trees. They had, of course, been long familiar to me, but I had always carefully avoided committing myself to a definite opinion about them, though strongly leaning towards the view of their hybrid origin. I therefore found it

* Enclosure in No. 422.
† Pharmaceutical Journal, October 1881, page 351. I have not the original report.
‡ This was Spruce's determination of the real "Pata" of Chimborazo (see Weddell, "Notes" l.c. page 30).



necessary to state my position, which I did in a letter to the "Ceylon Observer" Newspaper, 27th November 1881. I may here be permitted to quote the conclusion of this communication. The name *robusta* which I here proposed to adopt was, Colonel Beddome informed me, in use on some estates in South India; it is now commonly employed in Ceylon for the trees in question.

"I also desire to say a few words as to the name which this Cinchona should bear. It is I think much to be regretted that the name "Pata de Gallinazo" should have been brought out of its obscurity by Mr. Cross and adopted (even provisionally) by Colonel Beddome. This is a mere bark-collector's name and is used in different parts of the Andean chain for at least six different kinds of bark. That which has the best claim to it (as having been first published and more often used) is the best sort of grey bark collected by Pritchett in Huanuco and referred to *C. peruviana* or *C. micrantha*.

* * It is, of course, the case that the name is also used for the "Cascarilla serrana" or Hill Red Bark, which Dr Spruce obtained on Chimborazo at 8,500 to 9,000 feet, and with which Mr. Cross (who accompanied Dr. Spruce as gardener) now identifies the plant under discussion.* * * *

It is to be hoped that the copious dried specimens sent home by Colonel Beddome for comparison with types in the London Herbaria may clear up the matter; but this cannot be very confidently expected. Meanwhile, I would recommend the suppression of the Spanish name of "Pata de Gallinazo" for our "hybrid." If the tree has been duly described and named, we shall, of course, get the proper appellation in time. If not or till then—since the names "pubescens," "magnifolia," "villosa," and others are all, for various reasons, unavailable—we cannot, I think, do better than adopt that already coming into use in Southern India, *robusta*, which is a very appropriate one. By using this, we do not commit ourselves to any views as to the origin of the plant, whether on the plantations of the Nilgiris, or the higher slopes af Chimborazo."

Colonel Beddome's specimens were duly examined by the Kew botanists. Mr. Dyer in his letter upon them (24th January 1882) agrees that "*magnifolia*" and "*pubescens*" are practically one and the same plant. As to "Pata de Gallinazo," he points out that Mr. Spruce has described this and the closely allied "Cuchicara" in his report (Blue Book I, pages 116, 117), that his specimens are in the Kew herbarium, and that "although there is some resemblance in the foliage it may be said with some certainty that the Nilgiri '*magnifolia*' is not the 'Pata de Gallinazo' of Chimborazo." It is further remarked that Spruce's specimens have been referred by that botanist and by Howard to *C. erythrantha*, Pav., and that "this identification is probably correct;" also that Mr. Triana considers both these specimens and *C. erythrantha*, Pav. as belonging to the species *C. pubescens*, Vahl. It is decided that "the most probable account that can be given of the forms '*pubescens*' and '*magnifolia*' is that they are hybrids between *succirubra* and *officinalis*."

With reference to the "unknown species" (No. 18) no opinion is expressed; as the specimens collected by Mr. Cross were in private hands no comparison could be made.†

8. *Dr. Bidie's Reports.*—Meanwhile Dr. Bidie had been requested by Government to enquire into Mr. Cross's assertions, and to collect a good series of all the Naduvatam Chinchonas and their barks. In his letter (No. 199), dated 3rd March 1882, he summarily disposes of the notion that any mistake had been made as to the plant known as *C. succirubra*. He shows that "*pubescens*" is not, as Cross maintained, *C. succirubra*, but suggests that it will probably be found, on comparison, to be "identical with Spruce's pubescent "Cinchona of Llalla," above referred to. As to the *magnifolia* Dr. Bidie considers Mr. Cross's identification with "Pata de Gallinazo" "will probably prove correct." For both these opinions his basis is Spruce's brief description above noticed. In a further letter (No. 284), dated 29th March, written after perusal of the remarks of the Kew botanists, Dr. Bidie still supports the above contentions, on the grounds of (*a*) the occurrence of the plants in the oldest plots of the Nilgiri plantations, (*b*) the probability of the truth of Cross's positive statement, (*c*) the improbability of two hybrids so similar to Spruce's two plants arising spontaneously, (*d*) the want of a tendency to depart from type, and (*e*) the fragmentary character of Spruce's specimens (as gathered from his narrative) rendering the comparison possibly fallacious. Sir J. Hooker in reply (letters, dated 13th June, 7th July and 3rd August) can see nothing in these observations to cause him to alter the views previously expressed that "the plant called '*magnifolia*' is not the 'Pata de Gallinazo' collected by Spruce; neither is the plant called '*pubescens*' the 'Cinchona' of the same traveller."‡

A collection of well selected and dried specimens of 38 different forms was made by Dr. Bidie (with an accompanying series of the barks from the same trees) and forwarded to Kew

* Colonel Beddome's report (page 8.) contains the extraordinary assertion (derived from Mr. Cross?) that Dr. Spruce "could never have seen the trees." But the latter describes their appearance, bark and leaves—the flower and fruit he did not get—in his paper in the "Journal of the Linnean Society" iv. page 185. Indeed, it is Mr. Cross's share in this matter that is the novelty.
† On the identification of this plant see paragraph 16 of this Report.
‡ Paragraph 19—22 of this Report continue the discussion of these questions.

where I had the opportunity of examining them in July last.* The trees supplying these were permanently labelled with the same numbers as the barks and specimens, so that they can be readily referred to at any time. The examination of Dr. Bidie's collection led to the following remark by Sir Jos. Hooker in his letter of 3rd August: "Crossing has evidently gone on so extensively that no one but a botanist accustomed to the *facies* of living Cinchona plants could pronounce an opinion upon the mixture of forms with any authority or without the risk of adding to the confusion of nomenclature."

9. *C. succirubra*, Pav.—I now proceed to the observations I have to make on the botanical characteristics and names of the trees inspected by me in the Nilgiri plantations.

In regard to Red Bark, I can very confidently endorse the opinions expressed by all the botanists who have examined the matter, that the well-known tree which forms the bulk of Naduvatam is the true *C. succirubra*, Pav. I have examined Pavon's own specimens in the British Museum which precisely correspond with the ordinary Red Bark of India, Ceylon and Jamaica. This has the leaves generally more or less pubescent or puberulent beneath, as is the case with Pavon's specimens; and Mr. Howard is mistaken in saying† that the common plant in India is perfectly smooth. Dr. Spruce's description at p. 104 of his octavo report of 1861 is very good.

I must, however, allow that I found *succirubra* in Naduvatam a more variable type as to foliage than I am accustomed to in Ceylon. Among the large trees in the original plots are to be noticed, besides the ordinary kind with leaves glabrous above and pubescent beneath, not a few which have leaves at least when mature altogether smooth; some again are persistently hairy on both surfaces. There were also a few trees with remarkably narrow leaves attenuated at the base. As a rule, the leaves are less bullate and smaller than in Ceylon, but it must be remembered that Naduvatam is a somewhat higher elevation than this species is usually grown at here. I have no doubt that some of the leaves from the Naduvatam red barks would be called "pubescens" in Ceylon, and I am also convinced that this is partly due to many plants and seeds of this kind having been actually sent out from the Naduvatam plantation under the latter name.

A few miserable and scarcely recognizable little trees were all I saw of *succirubra* on Dodabetta.

10. *C. Calisaya*, Wedd.—I have little to say about the plants included under this name represented in the Nilgiris.‡ There are patches both on Dodabetta and Naduvatam, but neither contain any well-grown trees. As may be seen from the list in paragraph 4, they are of various origins. A plot on the east slope of Dodabetta low down planted in 1865 (said to be from Mr. Money's seed) presents the extraordinary mixture of varieties that one is accustomed to in seed from Java. The bulk are the varieties known as "*jaranica*" and "*vera*" in Ceylon, but there are also a few trees of *succirubra* and *micrantha* and two or three of what I am accustomed to consider a hybrid between *calisaya* and *officinalis* occasionally met within Ceylon plantations. Among them, too, the Superintendent, Narrainsawmy, pointed out two or three which he said Mr. Moens, in his visit in 1880, had pronounced to be *C. Ledgeriana*, but these were not in flower, and I am not able to distinguish this species with certainty from foliage alone.

At Naduvatam, as would be expected from its locality, the *calisaya* varieties are rather better in growth, but even here they are gradually dying out. Dr. Bidie selected no less than fifteen sorts for his dried collection which exhibit a wide range in size and shape of leaf, size and colour of flower and form of the seed-capsule. A large and broad-leafed form is that which grows most vigorously. I saw nothing like *C. Ledgeriana* among them. As might be expected, a fair number of the very broad-leafed large-flowered hybrid with *C. succirubra*, *C. anglica*, How.,§ were to be seen in Naduvatam.

11. *C. officinalis*, L. (*C. condaminea*, Humb. and Bonpl.)—Dodabetta plantations are almost entirely composed of this species which grows there to perfection; there are also a large number at Naduvatam. In common with other botanists who have been recently over the plots I failed to detect many marked varieties; indeed what particularly struck me was the remarkable uniformity of type prevailing throughout the vast expanse of Dodabetta‖; no greater variety prevailed than in a plantation of oaks, elms or poplars. If it be desired to distinguish

* The dried specimens have since been transferred to the herbarium here at Peradeniya. Dr. Bidie has since prepared and transmitted to the Pharmaceutical Society's Museum in London, a still larger series but with the same nomenclature.

† Pharmaceutical Journal, October 1881. Nor do I think he is correct in stating that bark of "Pata," of "pubescens," or of "cuchicara" is sent home from India or Ceylon under the name of "Red Bark;" though, no doubt, *succirubra* bark may have been sent as "hybrid pubescens."

‡ I notice that in the most recent enumeration of the trees (31st March 1882) no estimate of the number of Calisaya is attempted, the space being left blank.

§ Well figured by Howard in his "Quinology" t. 10. He raised it from seed sent from the Nilgiris by Mr. Broughton and taken from an ordinary *Calisaya* which had doubtless been crossed by neighbouring *succirubras*.

‖ McIvor in 1869 says (Report, par. 9) that from the three original kinds of Crown Bark, at least seven distinct varieties had been raised. He is said afterwards to have distinguished as many as twenty-two sorts. Mr. Broughton mentions as many as twenty.



by names the differences in the width of the leaves it would appear that the broadest one represent *C. Uritusinga*, Pav. and the narrowest the true *C. crispa*, Taf; the intermediate ones being the vars. *Bonplandiana*, How. and *augustifolia*, Wedd. I am unable to separate these, which completely pass into one another. I had expected to find here something more distinctive as *Uritusinga*. Two varieties bear the plantation name of "*augustifolia*" and are distinguished as "No. 1" and "No. 2;" the latter has by no means a narrow leaf. One of these represents apparently Mr. Broughton's plant (No. 10 of the list in paragraph 4.*) A vigorous propagation was going on by seed of another form; which was called "*crispa*" by McIvor and Beddome, on what grounds I have no idea. This form has rather acuminate leaves and very large flowers, and is remarkable for the development of a very thick corky outer bark. I saw but one plant, but there are said to be seven or eight in Dodabetta. I also detected two plants of *officinalis* (both broad-leaved) distinctly pubescent beneath.

12. *C. lancifolia*, Mutis.—Though this has been in cultivation from the very commencement of the plantations, very little has been heard of it; and recently it has quite dropped out of notice being no longer included in the annual lists. The few existing trees are the survivors of the numerous descendants of a single plant which was all that was saved out of six brought from Java in 1861. The two or three that I saw were in the lower part of Dodabetta near the Jalap Garden. I was at first inclined to treat them as another form of *officinalis*, but a closer examination has since shown me their distinctness, if not as a species at least as a well-marked variety. The habit and leaves are certainly very like an ordinary *officinalis*, but the calyx shows a marked contraction above the tube, and its free part is sub-campanulate and spreading with rather large triangular sequents; the disk is very thick and prominent, and the corolla large, dark lake and with a broad tube; the large calyx is persistent and crowns the oblong-ovoid capsule. The different calyx seems to separate it from all forms of *officinalis*.† A figure, reduced from the magnificent plate of Karsten's Columbian Flora, will be found in Markham's "Cinchona Species of New Granada" page 53, where is also reprinted a full description. The cultivation of this species is maintained in the Java Government Plantations.

13. *C. micrantha*, R. and P. *and its allies*.—The Grey Barks require no particular notice here. However important a place they may have once occupied in the plantations, they are now practically extinct ‡ Isolated specimens can be found on Dodabetta, Naduvatam and Wood plantations, the last survivors of their race. They have died out rapidly: in 1878, close upon 800 trees of *micrantha* were counted on Wood plantation, I saw but one moribund specimen. It is, therefore, unnecessary to make any remarks on their botanical characters; which is somewhat fortunate as these species are very obscure as to their nature and affinities.

14. *C. carabayensis*, Wedd.—(*C. Pahudiana*, How.). Several healthy trees of this pretty but useless species are still growing in the earliest-planted plots at Dodabetta. Its characteristics are quite well known and its interest to Quinologists chiefly historic. Dr. Bidie includes a specimen (No. 36) from Naduvatam in his series.

15. *C. pitayensis*, Wedd.—Of this remarkable species there are some 45 or 50 trees in a clump near "the Jail" at Dodabetta. They are very striking from their habit being so unlike all the other cultivated species; indeed they rather suggest at first a Lauraceous tree or a *Symplocos* than a Cinchona. The species is but little known to botanists, but Howard has given an excellent figure in his "Quinology" t. 12.§ The branches curve strongly downwards for most of their length and then turn upwards suddenly at their ends; here the leaves are crowded, which are stiff, thick and polished, and stand erect with their pointed ends upwards. The trees were past flowering at the time of my visit, and I was unable to examine the corolla, so remarkable for being hairy within; but the young fruit was characteristic enough, crowned with the presistent long, almost setaceous calyx-segments. I was glad to see that some propagation of this species was being undertaken; it appears to have been singularly neglected. It is true we read in the reports of the late Superintendent of 500 planted out in 1872 at Dodabetta and 400 at Hooker plantation and of no less than 4,386 put out in 1874 at the latter‖, but not one of these, I believe, now exists. The tree affords true Pitayo bark; three different varieties were collected by Mr. Cross, and I noticed among the trees some varying slightly from the rest in having shorter and broader leaves.

16. *C. Humboldtiana*, Lamb.—I was enabled to name Colonel Beddome's unknown species, the "celebrated *C. crispa*" of Mr. Cross (see paragraph 6), from my examination of the material in the London herbaria. The original specimens of this species were collected by

* It appears, however, that Broughton's original tree is no longer in existence.

† True *C. Chalmarquera*, R. and P. (not of Howard, which is merely narrow-leaved *officinalis*) is closely allied or intermediate; and *C. macrocalyx*. Pav. (as figured in Wedd., Hist., Quing. t. 4 bis., fig. A) must also be very near *C. lancifolia*.

‡ The plantations were, however, still credited with the possession of 1874 plants on 31st March 1882 (see Report 1881-82).

§ The figures of *C. Corymbosa* and *C. Triana* (both referred to *C. pitayensis* by Triana) as reproduced from Karsten in Markham's "Cinchona Species of North Granada" very little resemble the Dodabetta trees as to foliage.

‖ Report for 1873-74, paragraph 3. The plantation books ought to give some details as to the precise plots where these were planted.

Pavon; they are in the British Museum and labelled by him "C. sp. nova de Jaen de Loxa en Quito." The sheets are named by Lambert *C. Humboldtiana*, a name which he published in his Illustrations of the genus Cinchona" in 1821, where, however, his description does not perfectly agree with his specimens. What I consider to be the same species was also collected by Spruce in August 1856, "in Monte Campana prope Tarapoto, Peruviæ orientalis" and is numbered 4,832 in that traveller's extensive series of dried specimens. Though Mr. Crosse' determination of it as "*C. crispa*" may be disregarded, yet that he may have collected the seed is evident from the fact that one of the three dried specimens* he brought back with him is this very species. This is ticketed as follows:—"No. 3, *C. species*. In deep ravines on the Sierra de Campana and Koritroche. This species of Cinchona grows on steep banks of ravines in rather moist situations, it is frequently found in the mountains of Samora which lie eastward from Loxa and is sometimes collected by the wild Indians which traverse that tract of country. This tree grows fron 50—60 feet in height, Oct. 18, 1861, R.C." Of this specimen Mr. Markham writes:† "Bark and leaves of *C. lucumæfolia* of Pavon, from Zamora. This is the 'Cascarilla de hoja de lucma' of the natives." He adds, "Mr. Cross made no attempt to collect the seeds as this specie is comparatively worthless;" but be that as it may, the plant has clearly reached the Nilgiris.

Colonel Beddome was by no means the first to notice this at Dodabetta.‡ Specimens are included in the series made up by Mr. McIvor § for the India Office in 1873 (see Blue Book V., page 91) where they are numbered 24 and called merely "Corky Bark." I have examined them in the British Museum duplicate set.

*C. mutisii*, Lamb., appears to differ only in the leaves being smooth above, and probably ought to be combined with the present species. To this is to be referred the *C. microphylla* figured in Howard's "Illustrations" t. 17, fig. 1, which plate is a fair representation of the Dodabetta plant with the exception of the slight difference above mentioned. Howard's plate of *C. villosa* (Ill. t. 6) is referred to *C. Humboldtiana* by Triana (and "*C. villosa*, Pav. MSS." is certainly quoted by Lambert), but cannot represent that species.

This plant is clearly a near ally of *C. carabayensis* (*Pahudiana*) and is probably equally valueless; it differs in its smaller calyx, much less conspicuous in fruit, its less hairy capsule, and its smaller thicker leaves which are rounded at the base instead of tapering, and stiffly hairy above as well as beneath even when fully grown; when dried, their margins are strongly recurved. The large development of cork on the bark is probably an accidental circumstance.

17. *Santa Fè Bark.*—The two surviving plants of this valuable Cinchona are both at Dodabetta, one planted out in the lower part of the North-east side, the other still in a pot in the propagating house. They are now 2½ years old, and that planted out is about three feet high only. The few leaves they possess are peculiar and appear to indicate a species quite unknown to me. The figure (fortunately not coloured) in Howard's "Quinology" t. 14 is a very good representation of them. Both Weddell and Triana place the "Calisaya of Santa Fè" under *C. lancifolia* ‖; and, in default of further material for comparison, here it must remain for the present.

18. *Carthagena Bark.*—There are seven plants of this permanently put out at Dodabetta and two at Naduvatam; the latter are the more healthy and the larger is about four feet high. Numerous cuttings are in the propagating houses. There is also a fine plant in Sim's Park at Coonoor.

Of the name of this handsome species I am quite ignorant; it has possibly never yet been defined or named. The leaves of seedlings and young plants are useless for comparisons, being frequently very different from those of adult trees; in these plants they resemble those of *micrantha* more than any other species. The "Hard Carthagena Bark" is usually referred to *C. cordifolia*, Mutis, a variable species with a very wide distribution in South America. Mr. Howard has suggested an affinity with *C. purporea*, R. and P., which, to judge from the description and his plate (Illustrations t. 11) seems to be probable.

19. *C. robusta.*—In paragraph 5, I have given a sketch of the opinion which prevailed as to the plants I include under the above name, up to the year 1880; and in portions of paragraphs 6, 7 and 8 are detailed the successive views of Mr. Cross, Colonel Beddome, Dr. Bidie, myself and the Kew authorities. I entered on the examination of the Nilgiri trees with no strongly

* These specimens, formerly in the possession of Mr. Markham, were presented by him to Kew Herbarium, February 1882, where I had the pleasure of examining them.

† "Peruvian Bark," p. 238, footnote. I have examined the type specimens of *C. lucumæfolia*, Pav., from Loxa; which is a totally different plant with narrow and pefectly smooth leaves.

‡ Mr. Howard, in a notice of Colonel Beddome's Report (Pharmaceutical Journal, October 1881, page 354), says the plant should be *C. decurrentifolia*, Pav.

§ It is doubtless also the plant alluded to by Mr. McIvor in his Report for 1869-70 (paragraph 5). "Among our Crown barks we have this year discovered a very interesting and apparently a new species with soft downy leaves and a rough corky bark, but deficent in alkaloid. This plant was raised from the original seeds introduced by Mr. Cross through Mr. Markham, and must have been gathered by accident" (Blue Book V, page 6).

‖ I am unable here to refer to Mr. Howard's paper in the Bull. Soc. Bot. France, Vol. XXII, on *C. lancifolia* var. *oblonga* referring to this plant.



settled opinion as to their nature, though my Ceylon experience had more and more inclined me to look upon them as hybrid forms rather than as one or more autonomous species.

I found the forms presented to be quite those so common in Ceylon plantations. Generally robust well-grown trees, larger, hardier and healthier than either the *officinalis* or *succirubra* among which they were scattered and often flourishing where neither of them can thrive. Botanically, there was just the same range of variety, the extreme form in one direction, with its dark green smooth shining leaves, closely approaching some of the large-leafed forms of *C. officinalis*, and that in the other direction with its large pale thinner leaves more or less pubescent beneath, so close to the hairy form of *C. succirubra* as to be often with difficulty distinguished from it. Between these, as regards color and pubescence, were many intermediates, though undoubtedly, with a little ingenuity, the whole can be thrown into the two groups. There are not many on Dodabetta (where are no *succirubra*), and these are nearly all of the glabrous sort, but on Naduvatam they are much more numerous, and in parts both there and at Hooker plantation they stand out conspicuously above the more or less sickly and stunted kinds round them.

As the chief of the test-points as to origin was the alleged occurrence of a few "in the oldest plots" at Naduvatam, I particularly examined several. They are certainly growing in plot No. 1, planted in 1862, and are of both the glabrous and pubescent kinds.* They are also undoubtedly old trees, but that they form really a part of the 1862 *planting* cannot, I think, be affirmed with certainty. From the look alone I do not think it possible to say whether a gum tree be twenty years old or sixteen; it is therefore necessary, in the present case, to see whether there are any grounds for supposing that the *robusta* trees may have been supplies put in to fill up vacancies in the original planting. With one tree this appeared to be the case, as it was clearly out of the line, but in two others there was certainly nothing in the surroundings to suggest that they were not part of the same planting as those around them. But the question is of such importance that it requires further examination.

*C. succirubra* first flowered in 1863,† but I have no evidence that *C. officinalis* did so before 1865. In that year, however, both trees ripened seed, and in the next the majority of the young plants were being raised from seed.‡ We have it on Mr. McIvor's authority that "in 1866 a number of hybrid seedlings were produced" and that "the selected varieties were planted here and there in every way, soil, exposure, and elevation available."§ In that year, 1866, six hundred of the first plants, planted out in August and September 1862, were cut down for their bark;‖ and though nothing is said as to the filling up of the gaps thus caused, this was certainly done, as is evident from the regularity of the existing plots. It is very likely to have been effected with the new seedlings; two or three years later, Mr. McIvor expressly states that "all the supplies are plants raised from seed."¶ What therefore more probable than that some of these "hybrid seedlings," which were planted "in every way available," should find their way into the 1862 plantations along with the other supplies in 1866-67.

One of the trees pointed out to me in this 1862 plot was one of those hybrids denounced by Mr. Broughton (31st July 1871) as "combining the bad qualities of both their parents."** Now, he could scarcely have called this tree a hybrid if he had not good grounds for believing that it was no part of the original 1862 plantation in which it grew; indeed he states definitively (13th February 1873) that the hybrids "appear only among seedlings, *there being none among the original trees*."†† I may add that in this same "1862" plot there are several trees of *Calisaya* which cannot be any part of the first planting.

A search through the late Superintendent's papers and the plantation records might very probably give much information as to this and other historical matters. He has stated that he always reckoned 30 per cent. of every year's planting as failures to be subsequently filled by supplies, a fact which the recent compilers of statistics of the plots seem to have scarcely fully realized.

These remarks may be considered a sufficient answer to the first of Dr. Bidie's arguments (see para. 8). I will now proceed to discuss the remainder of them.

20. *Mr. Cross' credibility.*—Dr. Bidie thinks Mr. Cross' positive statement that he sent plants of "Pata de Gallinazo" to India to be probably true. To my mind I must say that "probability" points rather the other way. Dr. Bidie has himself remarked on the "little reliance" that can be placed on that traveller's memory, and indeed we have abundant evidence of its treacherous character. It has made him give two different accounts of this very matter, caused him to forget well-known facts and make unfounded statements about Dr. Spruce, hopelessly confused him over the distinctions between *succirubra* and *micrantha*, and supplied him

* Nos. 2, 3, and 4 of Dr. Bidie's set.

† Kew report for 1863; Journ. Bot., 1863, p. 254.

‡ McIvor, Reports, 1864-65 and 1865-66, para. 5.

§ *Id.*, Report, 2nd August 1875. Mr. McIvor believed these to be the result of his experiments in artificial cross-fertilization; it may be so, but it is perhaps more probable that they arose naturally. In either case they appeared.

‖ McIvor, Report for 1866-67, para. 2. This important fact seems to have been overlooked by subsequent writers.

¶ McIvor, Report, 1869-70.

** This particular tree is a glabrous *robusta* with the leaf more elongated than usual. Colonel Beddome considered it "glabrous *pubescens*."

†† Letter to Howard, printed in his "Quinology," p. 113. The italics are my own.

with a totally erroneous name for the plant, "No. 3" of his collection, now shown to be *C. Humboldtiana*. These reminiscences indeed seem singularly confused, and I do not consider it necessary to further allude to them.

21. *Alleged stability of type.*—Another point urged by Dr. Bidie (*d*) in favor of the autonomous nature of this plant is, as he thinks, the want of a decided tendency, "as in the case of hybrids," to vary more than is usual in other undoubted species of *Cinchona*. I need scarcely remind Dr. Bidie that cultivated plants supply us with abundant examples of known hybrids as permanent as most species; but as regards *C. robusta* our experience in Ceylon is very different. It is notorious that the seed is most uncertain, and it is well known that Mr. McIvor would not trust it. On his visit to Ceylon in 1875-76 he gave seed of his best "*pubescens*" to several careful planters here; the result in one case was 10 per cent. like the parent, and the remainder varieties of *succirubra* and *officinalis*; and this has been the so general experience here that I am indeed surprised to read of a different state of things in the Nilgiris. In Darjiling Dr. King states that "about half" the plants from seed come up "officinalis."* Colonel Beddome could not deny these facts, but tried to explain them by careless collection of seed, but I know of cases where this source of fallacy was most carefully guarded against with no difference in the result. Colonel Beddome himself must at the last have had doubts, for he allows that it is better to grow the plant from cuttings.† It is indeed this reversion to apparently parent forms that is one of the chief reasons for regarding *robusta* as a hybrid.

But we have more direct testimony of its origin. I am assured by planters of credit that they have grown both glabrous and pubescent *robusta* from seed of ordinary *officinalis*, and that it is by no means unfrequent for seedlings of them to appear in seed-beds on estates where no trees but *officinalis* and *succiruba* occur. I have myself seen seedlings of *robusta* self-sown where there are no parent trees of the sort whence they could have been derived; and at one time I was inclined to regard it as a variety of *officinalis*. There are, I think, grounds for believing that *succirubra* generally supplies the pollen and is therefore the male parent, both in the case of *robusta* (succirubra and officinalis) and *anglica* (succirubra and calisaya). I do not care to attach any great importance to bark-chemistry alone as a botanical character, but it may be noticed, as bearing on the derivation of these trees, that the analyses of their barks (though very variable) combines as a rule the characteristics of both Red and Crown barks.

22. *"Pata de Gallinazo" and "Cuchicara" Barks—C. erythrantha*, Pav.—The two remaining arguments advanced by Dr. Bidie become of less importance in face of what has now been stated. The specimens of "Cuchicara" and "Pata de Gallinazo" collected by Spruce ‡ are no doubt imperfect ones; they have, however, proved sufficient for one of the most careful of botanists, M. Triana, to identify them with *C. erythrantha*, Pav.,§ to which Messrs. Spruce and Howard had also, with doubt, referred them. The flowers of the more pubescent specimen of the "Cuchicara" are described by Spruce on his ticket as "deep brick red," a tint I have never seen in any Cinchona flower in the East. The leaves of all his three specimens are more or less pubescent. Dr. Bidie rather begs the question when he argues that the fact of the imperfection of these specimens is in favor of the Nilgiri plants being the same, and then proceeds to remark what an "extraordinary coincidence" it would be that two hybrids approaching so closely these wild South American plants should arise in the Nilgiris. It is not admitted that these *robusta* forms *do* approach Spruce's specimens very closely; on the contrary such eminent botanists as Sir J. Hooker, Prof. Oliver, and Mr. Thiselton Dyer express themselves strongly to the contrary effect. The wider tube of the corolla in the "Cuchicara," which is obvious, the color of the flower, and the character of the inflorescence are good distinctions.‖

On a review of the whole question then I am of opinion that the additional evidence derived from an inspection of these forms of Cinchona in the Nilgiri plantations does not by any means prove the improbability—still less the impossibility—of their being, as so long believed, hybrids of local origin between *officinalis* and *succirubra*, which opinion is, on the contrary, supported by a large number of facts of observation and warrantable inference.

23. *Uniformity desirable.*—In conclusion I wish to add a plea for uniformity in nomenclature. It is very much to be desired that the same plants should bear the same names in India and Ceylon and elsewhere, and that obsolete, incorrect, or duplicate names should be abandoned. No less than three different Cinchonas are called "*crispa*" at Dodabetta; it is rightly applied but to one, and that is so ill-defined that the name might well be dropped altogether. The various denominations bestowed on the hybrids may be entirely dispensed with as incorrect or

* In his Report of the Bengal Cinchona Cultivation for 1881-82 Dr. King distinguishes "six distinct forms" of these *robusta* hybrids.

† Beddome, Report on the Sikkim Plantations.

‡ It should be remembered that these were collected in 1859, before Dr. Spruce was employed by the Indian Government or Mr. Cross was engaged.

§ C. *erythrantha* is figured in Howard, Illust. t. 12. It is considered the same as *C. pubescens*, Vahl. by Triana. The descriptions (but not the figures) in the same work of the following are also referred by M. Triana to *C. pubescens*, Vahl.; *C. coccinea*, How.; *C. Palaiba*, How.; *C. subcordata*, Pav.; and *C. suberosa*, Pav.

‖ I may add with advantage that in my careful search through the public herbaria of London I did not find any Cinchona from South America agreeing with either of the leading forms of *robusta*.



misleading; *magnifolia*, pata, cuchicara, *pubescens*, *ullosu*, &c. The glabrous and pubescent forms are now allowed on all hands to be of similar nature, and a single name is sufficient. Those who are convinced of their hybrid character may use the descriptive title *succirubra-officinalis*, or the shorter name *robusta*, whilst those who still think them an autonomous species of South America are bound to call them *C. erythrantha*. Of course I am not speaking of *barks*; planters and merchants may give these what names they require in the vernacular, but with these names the botanist, as a botanist, has nothing to do.

The only other remark I have to make is to suggest whether the time has not now arrived when the Madras Government might adopt the spelling of this genus of plants followed by scientific men. So far as I am aware, there is not one living botanist who writes it in any other way than *Cinchona*. The matter is a purely technical one; systematists have long ago decided on the rules governing such cases of nomenclature, and the present one is not to be regarded as a subject for discussion. Were it permitted to amend the Latin genera which do not happen to agree precisely in spelling with names (it may be Russian, Hungarian, or Japanese) of the persons whom they are intended to commemorate, many besides *Cinchona* would have to be altered. But it is not so permitted.

## PART II.—PRACTICAL SUGGESTIONS.

24. I have now concluded the remarks I have to make with regard to the botany of the Cinchona plantations, the subject upon which I was requested to report. But I have reason to believe that some observations upon the principles which ought to regulate, in my opinion, the future management of this fine State property will be acceptable to the Government. I take it for granted that the recent appointment of Mr. Lawson, of Oxford, to the office of Superintendent is evidence of a desire to maintain the plantations in a high state of efficiency.

25. *Management for past six years.*—It is to be feared that on the whole, during the last few years, the conduct of the estates has not been altogether satisfactory. They have been managed too much with a view to revenue, and without that constant care and oversight which was (at any rate for many years) bestowed by the late Superintendent. I consider that both the plantations and the trees have been overworked. Though many trees have been frequently barked on Naduvatam and Hooker still appear healthy and cannot be said to have been much hindered in growth, yet, owing to the very imperfect renewal of bark—only in short strips or patches—it is now impossible to get any good samples or to practise the shaving method. I think that very many more trees should have been left untouched; we have yet to learn the effect of removing the bark upon the longevity of the trees and the real life-history of Cinchona in the East. The recent supplies or renewals do not appear to have been very successful, the number of failures being very large.* No vigorous attempts towards increasing the specially valuable sorts or the recent introductions have been made; even the Pitayo barks—obtained at such cost and trouble, and specially recommended in 1878 by Government for further cultivation—remain little more than curiosities, and no effort to propagate the valuable Santa Fè has been made since Mr. Cross' departure.† Selection by cuttings or seed from the best of known analyzed trees (by which system, steadily persisted in, the Dutch in Java have so largely increased the value of their bark) has not been practised, nor is propagation of the delicate sorts by grafting on more hardy varieties carried on. I know from experience that seed has not always been carefully collected, and that there has been a good deal of confusion between "*pubescens*" and *succirubra*.

26. *Necessity for a good propagator.*—Under a new *regime* we may expect to see attention paid to these things as well as to experiments in artificial hybridization ‡ and its results, the effects on longevity and health of the processes of stripping and shaving respectively, &c. I venture, however, to suggest that the assistance of a skilful propagator being necessary, such an addition to the staff of the Superintendent may (if necessary) be made.

27. *A scientific culture the object for the future.*—Progress in knowledge and improvement in practice, and not gain, should be the main objects of Government in the management of their plantations. I do not forget that the ultimate end of the enterprise is the production of a cheap and efficient febrifuge for India and the East. But this great purpose will be in no way retarded by the course recommended; on the contrary, as all that adds to our knowledge of barks cultivation will lead to the increase of private plantations and their successful and profitable culture, it must be forwarded and hastened. The subject is somewhat complicated by various other considerations; but probably the final realization of that grand and beneficent scheme is

* In the three official years 1878—81 no less than 33,407 red barks have died upon Hooker Estate alone (Beddome's Report, Appendix B); and I understand that the mortality of crown barks put in since has reached as much as 80 per cent.

† *C. lancifolia* (paragraph 14) should also be propagated. The latest analyses of this in Java (Moens' Report, 20th February 1883) show total alkaloids varying from 4·6 to 7·2 per cent., of which quinine is from 1·1 to 2·0. Though less valuable than *officinalis*, this species is rather better than the majority of the Java *Calisaya*.

‡ This subject was specially insisted upon in the Report of the Cinchona Commission of 1878.

more likely to be immediately effected by private enterprise in Europe or in India itself than by any local Government manufacture of alkaloids. Humanity will be equally benefited in the one case as the other. For the present this subject, however, may be allowed to rest.* Meanwhile the Government possesses a very valuable property, which, worked without stinting the expenses necessary for the highest experimental cultivation, cannot fail to return a profit for many years to come. More than twenty years ago the Home Government very justly remarked (Despatch, Secretary of State, Jan. 1863) that the Cinchona experiment could not be regarded as a mere money speculation, "nor are the commercial advantages that may be derived from it to be considered as other than a secondary consideration, though of course a return for the outlay and the spread of Cinchona cultivation by private enterprise are very desirable in themselves." How little, when these words were penned, could the present financial success have been imagined, and with how much more force do they now come, when even the outlay itself has been more than repaid, and a large and enterprising class of private genus of bark is in existence.

28. *Necessity of a Quinologist.*—The recent appointment is a step forward, but for any satisfactory progress to be made the chemist as well as the experimental physiologist and botanist is a necessity. For it must be remembered that it is *alkaloids* we want to grow, not bark only, and the cultural Superintendent is likely to be able to give us little accurate information about them. Further, the chemist must be on the spot, among the trees constantly, and always in readiness to work in unison with the Superintendent as one man at jointly-planned investigations. I desire to press this strongly, as the vast importance of constant analyses does not appear to have been realized by the members of the Commission of 1878, nor at first by Colonel Beddome.†

The Madras Government in supplying this deficiency will, in fact, be merely taking up again the work which was unfortunately dropped some eight years ago on the sudden resignation and disappearance of Mr. Broughton. The value of this chemist's researches is unquestioned, and his results are constantly quoted and acted upon. But his work was left quite unfinished, and it is to be feared that he got but scant assistance from the late Superintendent. He worked, too, a good deal in the dark as to the names and nature of the trees which were then very unsettled. Since his time this has been changed, and chemists have also given us a great mass of facts as to the chemical composition of the barks of all the cultivated kinds, the main characteristics and general relative value of which in the market are now quite well understood. But there are many questions of the greatest value to cultivators still pressing for solution. The range of difference in the proportions and quantities of the alkaloids in barks from trees of *identical botanical type* is very large, and the same is true of the plants raised from seed of a single tree. We know nothing of the causes of these *individual* differences. There is even variation in analysis of bark raised for cuttings of one and the same tree; yet it has been shown ‡ that the stock has no influence on the alkaloids of grafted shoots. It is thus clear that in the production of alkaloids the inherited nature of the trees is largely influenced by certain surrounding conditions, and these it is most important we should discover. The apparently good results which Mr. Broughton obtained from experimental manuring have never yet been corroborated or disproved. Even the cause of the increase of alkaloids in renewed bark is but little understood, and we probably are unable to avail ourselves of the fact to the full extent. The influence of age on alkaloidal composition in the various species is only guessed at from experience, but no series of analyses of selected trees at frequent intervals from the commencement of their lives onwards is available. There are samples of the investigations which only an analyst resident on the spot and working with the Superintendent can hope to decide.

29. *Position of the Government of Madras.*—All such researches however can only be properly carried on in a Government establishment, where the officers can devote themselves in a spirit of pure research to a work which must, of necessity, be spread over many years. And I will add that it is to the Government of Madras that all who are interested in Cinchona in any of its various aspects necessarily look to take the lead. No other Government, in fact, will be likely to undertake it. In Bengal, the production of febrifuge at present engages the whole attention of the staff, whilst here, in Ceylon, the Government possesses no plantations and is in no position to expend public money without an evident and quick return. It is true that from Mr. Moens in Java we have learnt much, but even there the object has ever been revenue, and we ought not, and need not, to be dependent upon what a foreign Government may please to make public. On the other hand it was Madras that was formerly in the front position. As the pioneer of Cinchona-growing in India it proved that the best barks could be grown there, and initiated a great industry. This it did as an experiment and with a judicious liberality at

* It has been thoroughly discussed in the Report of the Cinchona Commission of 1878, pp. 2—11, and with their opinions on the matter I generally agree.

† The latter however, after his visit to Ceylon, completely changed his views, and has expressed the opinion that the analyst is "all important." This opinion has been commended by Government to the Secretary of State (G.O., No. 1513, 13th October 1881.)

‡ Report for first quarter of 1883 of the Java Cinchona Enterprise.



immense cost. The excellent system followed has, from fortuitous circumstances, come to an end; under the very favorable present conditions, one cannot but expect to see it revived.

30. *Selection by Analysis.*—To go into any details of cultivation would be out of place here, but I may express the conviction that, in the present state of our knowledge, the most promising direction for the improvement of the trees as alkaloid-yielders is *selection based on analysis*. This is to be effected by the isolation of trees with high analysis, precautions to prevent cross-fertilization, care in collecting seed, analysis of a selection of the resulting plants, destruction of all that do not reach the standard of their parent, again isolation of the best trees, and so on for several generations. The same principle may be more readily applied to grafts and cuttings. It is clear that in such a cultivation it is the chemist who regulates the procedure: plants which his analyses condemn are ruthlessly destroyed, those which answer his test are preserved to become the parents of improved successors.

31. *Changes required.*—The desirability of a plantation at a lower elevation and with a more equable rainfall has been already recognized by Government (G.O., No. 1280, 29th August 1881). Neither *C. ledgeriana* nor any of the varieties of *C. calisaya* (of which there is good reason to believe there are some valuable sorts not yet in cultivation) succeed on the existing estates.* A site should be selected at about 3,500—4,000 feet in sheltered forest land. In some estates in such situations in Ceylon *C. ledgeriana* is doing very well, and has more than equalled the Java trees in alkaloidal yield.

On the other hand the utility of keeping up the Hooker and Wood plantations might be again considered. They have been obviously much neglected, and I see no advantage to be derived from their maintenance beyond the profit from bark sales.

32. *Arrangement of Records and Publication of Results.*—The only other suggestion I have to offer is perhaps scarcely required. It is that all the records, papers, notes, and orders connected with the Government plantations be brought together and properly arranged and classified, so as to be readily available for reference. There must be much in Mr. McIvor's papers supplementary to his rather meagre annual reports, and probably Mr. Broughton's notes would repay perusal. At all events the history of the plantations cannot be followed without ready access to all the records. For the future Government should take care that accurate note is kept of all work done in the plantation plots (as to deaths, supplies, renewals, and harvesting operations) as well as in the experimental houses and nurseries and in the laboratory. I will conclude by expressing the opinion that all results should be made promptly available to the public in annual reports, which also ought to be easily obtainable.

(Signed) HENRY TRIMEN.

* The *Calisaya*-forms hitherto introduced make very bad growth and are short-lived. They are also poor quinine-yielders. Of the fifteen barks of this kind selected by Dr. Bidie for analysis, only two afforded over 3 per cent. of that alkaloid (one, No. 14, gave 5·55), whilst one (No. 21) gave only a trace, and all showed a strong tendency to develop the least desirable of the alkaloids—cinchonine (as much as 4·40 in No. 17). Some may be tried at the lower elevation, but experience in Ceylon is not favorable to their cultivation.

Govt Gardens
Ootacamund
10.IV.1883

167

To H.S. Stokes Esq. - Secy to Government.

Sir

I have the honour to forward to you my "Report" on the present condition of the government cinchona Plantations, which have been placed under my charge, and on the changes, which I think should be made in their treatment, in order to secure a permanent remunerative yield of bark and their more economical upkeep — I have also the honour to report to you my opinion as to the desirability of government replacing the services of a skilled Quinologist, as suggested in Dr. Trimen's "Report". And again as to the practicability of Colonel Henderson's scheme for the establishment, with the aid of government, of a private company for the manufacture of the cinchona alkaloids on the Nilgiri Plateau.

Date of Receipt 9.7.83
Sent to Press 10.7.83
Rec'd from Press 10.7.83
Returned [illegible]
Sec'y to Govt [illegible]

The present condition of the Plantations.

Dodabetta. This magnificent plantation occupies 314 acres, and consists almost entirely of cinchona Officinalis - The trees are, for the most part,

in fine condition, and judging from their 169
appearance, I should say that, taking the estate
as a whole, it has not yet reached its full
prime. The trees upon the oldest plots being robust
and renewing their bark as well as when younger.
In some portions of the estate, however, where the
soil is poor, or the exposure to the wind of the
South West quarter too direct, the trees show
manifest signs that they are past their prime.
This is specially the case on plots 5. and 6. which
cover a area of about eleven acres: and I
should recommend that the trees on these plots
be at once either efficed, or uprooted and their
plots replanted.

I think the Government may confidently
expect that the yield of bark from this Estate
will continue slightly to increase for some
years to come.

Reclamations. This is another fine estate
the planted portion of which comprises 301 acres
The trees are chiefly Cinchona ~~robusta~~ succirubra;
though interspersed with these are many other
kinds, notably C. Officinalis and the procured
hybrid between C. Officinalis and C. succirubra
viz C. robusta, or as it is more commonly
called in this neighbourhood C. pubescens.
In the more favourably situated portions of the
plantation, the C. succirubra and C. robusta
are still growing vigorously, and show no

signs of their having yet reached their bearing
the older and larger trees renewing their 171
bark as ark and as rapidly as the younger
ones. There are, however, many parts of
the estate, where, owing either to an evil
exposure or to poverty of the soil or to both
of these causes combined, the trees are not only
lost their prime, but are dying off by thousands
I would recommend that those portions of the
estate, which are most unsatisfactory, should be
given up altogether, while the trees upon the
remainder should at once be either cupped
or dug up and their places filled with young
plants.

With respect to the yield of bark from this
Estate, I think the Government would be wise
to calculate upon a slight decrease for at
least the next few years.

Hooker. This plantation, the site of which
has been most infelicitously chosen, contained
at one time 154 acres planted with C. succirubra
C. robusta & C. officinalis. The estate has
generally been much neglected; and the trees,
some of them healthy, are for the most part
in a piteous condition, Hail, wind, frost
and a naturally intractable soil have rendered
whole regions desolate.
I should recommend that the estate cease to be
cultivated, as to repair the ravages of bad
neglect, would entail an outlay, which I believe

would never be remunerative. It is however situated four miles distant from Peddavellan under the management of whom Wood mussen it has been placed.

Wood And three plantations, occupying about 72 acres, and like the last unsatisfactory, both on account of its neglected condition, its poor or else poor soil and its liability to injury through the invasion of Saulers, Pigs and others pests — It is placed under the management of the Assistant Superintendent at Dadabetta from whose residence it is distant twenty miles.

I would recommend that the cultivation of cinchona on this estate be given up.

Proposals. Taking into consideration the unsatisfactory condition and inconveniently distant position of the Booker and Wood Estates I would propose that they should be either sold by auction as they stand, or that the trees upon them should be uprooted and the land realised in the ordinary way. I am inclined to think that the latter mode of disposing of the Estates would be the most profitable, as I doubt if an adequate bid would be made, if they were put up to auction. I would next propose that the proceeds of the sale of the Estates, or of the land should be devoted to opening out small tracts of land in

(say two acres in extent) at varying elevations in different parts of the Presidency, where the best ~~known~~ varieties of Cinchona may be grown, and reliable information furnished respecting the height at which, and the climatic conditions under which each may be most profitably cultivated — Again it is very desirable, for the purpose of securing ~~good~~ reliable seed, that a few plots of ground should be taken up at such a distance from ~~any~~ all Cinchona plantations as would render hybridization impossible. In each of these plots one variety only should be planted, and grown only with the view of raising seed.

All the tracts of land above mentioned might also be made available for experimenting upon plants other than Cinchona.

## Dr Trimen's Report

Botanical Observations With respect to the conclusions at which Dr Trimen has arrived in regard to the botanical aspects of Cinchona culture, I have only to remark that the experience I have gained since I came out to India leads me to adopt them as my own. I think, too, with him that it is most desirable that there should be an

uniform nomenclature, and we are to be congratulated that his recent visit to the original Cinchona plantations in India has enabled him to decide what name ought to be maintained in the case of all the most important species, varieties and presumed hybrids — In a short time, with Dr Trimen's assistance, I hope to be able to furnish you with a list of all the different kinds of Cinchona growing in India and Ceylon together with their synonymy.

Practical suggestions Dr Trimen suggests (para 26) that a good propagator should be kept, who should have for his duties the performing of experiments in artificial hybridization, in calculating the relative value of the stripping and shaving processes &c. All this however I think can be done by those at present employed on the estate —

Dr Trimen's other suggestion (para 28) viz. that a Chemologist is a necessity, is one, the force of which I feel every day. In order that any further advance may be made in the practice of Cinchona cultures it is absolutely necessary that we should be able to have analyzed a very

large number of our trees in different
stages of their growth, when treated under 179
different systems and when grown at different
altitudes. Whether, however, it would be better
for Government to re-establish the Laboratory
now which Mr Broughton formerly so worthily
presided, or whether the required analyses
could not be obtained in some other way
as well done and more cheaply is a matter
on which I shall dwell when discussing
the feasibility of Colonel Henderson's scheme

Colonel Henderson's scheme for establishing
a manufactory of sulphate of Quinine and
other Cinchona alkaloids on the Nilgiri
Plateau

In the despatch of the Rt Hon. the Sec'y of State
dated 21. Dec. 1882 I was desired to inform
this Government, so soon as I had gained the
necessary experience and local knowledge, of
my views as to whether or no it would be of
advantage to this country that Colonel Henderson
proposition to establish a factory for the
extraction of the Cinchona alkaloids should
be accepted — I have ~~now~~ carefully
considered this question, and I have now the
honour to report —
1st That I believe it would be possible,
eventually at least, to extract all the

cinchona alkaloids as are here as in England, or elsewhere.

2ndly That a private manufactory would be more desirable than one maintained by government.

With respect to the first point, the reasons I have to give for my belief are

A. although it is possible that the most expert English or continental manufacturers may at present be able to extract a larger ~~land~~ per centage of alkaloids, than is likely to be obtained by the less skilful operators in this country, it is to be remembered that this superiority would decrease in proportion as the workmen gained that dexterity, ~~superiority~~ which it may be presumed Experience would give them. Also, it may be taken for granted that the rapidly increasing knowledge, by which chemical methods and mechanical contrivances are being constantly improved, will tend to destroy any monopoly of trade secrets. And that, in the future, the manufacturer will have to seek for the elements of success more in his contiguity to the regions in which the bark is grown, and to a smaller extent to the market in which his drugs are sold, than to his being the sole possessor of some particular method, by which he can produce his commodity a trifle cheaper than his neighbours.

B. There are various expenses connected with transport, freight, &c, which would be saved. And this sum, not a small one, would be divided in portions, according to the energy displayed by each, between the grower, the manufacturer and the consumer. And supposing that, as in the ordinary arrangement of such transactions, the manufacturer obtained the larger share, he would be able to use a no inconsiderable sum as a set off against his supposed want of preliminary dexterity, and undue possession of a secret.

The following estimate of expenses connected with the transport of bark to England, though a rough one, is sufficiently accurate, and will show nearly enough the amount which would be saved on a ton of succirubra bark — I take succirubra bark because that is the most common sort on these hills, and will remain so for many years to come.

## Indian Charges.

| | R. | A. | P. |
|---|---|---|---|
| Cost of transport of one ton of bark to the coast | 40 | 0 | 0 |
| coast charges (packing) | 40 | 0 | 0 |
| Total — | R 80 | 0 | 0 |

## English Charges.

| | £. | s. | d. |
|---|---|---|---|
| Freight Landing charges &c = 15% on produce of sale. One ton of succirubra bark at 1/3 per pound = £140.0.0 — | 21 | 0 | 0 |
| Shrinkage | 4 | 18 | 0 |
| Total | £.2 5 | 18 | 0 |

Taking the Rupee as worth 1/8. The Indian charges are £. 6 . 11 . 4

Total sum connected with transport freightage &c, which could be saved £32 . 11 . 4

With respect to the second point — 1877 I think that a private company would carry on the manufacture of the Cinchona alkaloids with greater advantage than would be done by Government for the reasons that

1st There would be no ground for the cry, reasonable or unreasonable, that Government were interfering with private enterprise.

Lastly That as the Government could make use of the Chemist, who would be attached to the factory for the purpose of analyzing the bark of such trees, as might be necessary for resolving vexed questions, they would attain this desirable end at a cheaper rate, than they would if they were to employ a special Chemist of their own.

I would, therefore, recommend that Government should favour the establishment of a factory, such as has been proposed by Colonel Henderson — And in order that the capital necessary for starting the industry may be obtained, I would suggest that the following concessions and stipulations should be made.

1. That the Company should be given a plot of ground of such extent and in such a place, as the promoters may consider most suitable for the purposes of their factory — such plot to revert to government whenever it should be disused as a site for the purpose for which it was granted.

2. That for a specified term of years — say five — the Company be allowed to import or make, free of duty such chemicals as they may need for the purposes of their trade. The Company undertaking at the same time to adopt such measures as the government may think necessary to prevent fraud.

3. That for a similar number of years ~~that~~ the company shall be furnished by government at cost price with the necessary amount of fuel.

4. In consideration of these concessions, the company shall undertake to obtain the services of a competent Sanitary Inspector who shall be approved by government and who shall have for a part of his

duties, the analysis, at cost-price, of all such specimens of bark as the Director of the Govt Cinchona Plantations shall think necessary.

a. For the purposes of scientific experiment.

b. For the purpose of obtaining the market-value of any bark, which they may propose to offer to the Company for sale — it being understood at the same time that the Government will not consider themselves bound to complete the sale, should they, for any reason, afterwards think fit not to do so.

The following palpable objections may be raised to this scheme.

1. What assurance could be given, that in the interest of the Company a dishonest Quinologist might not return the Government bark as of a lower than its real value?

2. How shall an arrangement be arrived at, which shall be satisfactory at once to the Government as sowers, and to the Company as manufacturers, as to

the proportion, which shall be awarded [illegible]
to each, of the savings, which will be [illegible]
effected in respect of the expences, formerly
connected with transport freights and other
charges.

With respect to the first Objection I would
observe that in any case of dishonest dealing
on the part of the Company's Assistants, it
would always be possible to check the
result of his analyses by sending samples
of the same book [illegible] to some
chemist, whose reputation would like wise
above suspicion.

With respect to the second Objection I can
only suggest that in case of disputes arising,
recourse should be had to arbitration.

Within the last few days Government has
authorized the sale by auction of a portion
of their bark in Madras. And this — if it
is per allowed to be generally understood that
such sales will be constantly held — will
believe be productive of much advantage to
all growers of cinchona; inasmuch as it
will tend to induce buyers to make their
purchases in this country and so enable
growers to dispose of their bark more

readily than they have hitherto been able to do.

I have the honour to be

Sir

Your obedient servant

Jn. A. Lawson.

Director of the Government Cinchona plantations, Botanical Gardens and Parks.

12 SEP 95
DEPARTMENT

REVENUE (1883) DEPARTMENT.

No. 5769

From the Director of the Royal Cinchona Plantations Botanical Gardens and Parks Nilgiris

Dated 12th September 1883.
Recd. 13th

No. "

SUBJECT.

Reporting on the various questions connected with the Government Plantations

REVENUE DEPARTMENT.

No. 4387

From Dr. Jeanneret, Director of Royal Bot. Gardens Ceylon

Dated 30th June 1883.

FOR ORDERS.

G.O. 12th Dec. 1882. No 1399.
" 10th Feby. 1883. No. 201-C.

The circumstances which led to Dr. Jeanneret's deputation are detailed in the G.Os noted in the margin, in the former of which the correspondence between Kew and the India office and the Madras Govt. as to the Nilgiri Hybrids is printed.

The Botanical portion of the report will speak for itself to the public and the authorities to whom it will have to be communicated. Briefly Dr. Cross is again shown to be wrong on the Succirubra Hieracifolia question* Hieracifolia specific enough though species of Cals. Beddome which Dr. Cross proved to be C. Officinalis is found to be C. Humboldtiana and the species locally known as Pubescens and Magnifolia are declared to be Var

p. 9.

p. 16

p 17-22 Cuchicara and Pata-de-Gallina

* Herr van Gorkom (p: 102) says Hieracifolia seeds were often met with in Succirubra seeds received from Madras & that the English took little pains to prevent mingling & degeneration.

as Dr Bidie held but probably
hybrids between officinalis and
Succirubra as Sir Joseph Hooker
and Dr Trimen [illegible] along
held.* Dr Trimen seems to
think however that the
question is still an open
one — One point per-
haps calls for remark.

The first of the Govt
resolutions called rather con-
templated a report from a
skilled & disinterested meeting
of Dr Trimen, Mr Lawson
and Dr Bidie, but though
the last mentioned two
Gentlemen accompanied
the first they do not
join in this report

It is for consideration
whether any remarks from
them of concurrence or
dissent are to be recorded
with the report before it
goes to the officers of Govt
concerned, to the India
office and to the public
and it is presumed that
it will be left for Mr Lawson
to act on the suggestions
as to uniform nomenclature

* as to these hybrids see Von Gorkom
Pp: 112.226.

p: 23 probably

Part II

Some of the suggestions
contained in this report
have appeared in the Manage-
ment of the Government Farm
and Plantations
which should be

Mad

p: 25.

p: 25 & 30.

* See too Herr von Gorkom Pp: 237
seq. He says quantity not quality &
variety has been rather the aim of
the Directors of the Madras Plantations.



which he will doubtless
adopt.

Next as to the practical
suggestions made for future
management.

First it is for consider-
ation whether this portion of the
report should be communi-
cated to the public and it
is suggested that its com-
munication is perhaps
inadvisable in the face
of complaints made by
the Nilgiri Planters Asso-
ciation to H.E. the Governor
that the Govt competed with
planters, & the South Indian
Dr Trimen seems to be some-
what perverse and incorrect
in connection the internal
administration of the property
with which the public have
nothing to do.

Next it is submitted
that the indictment made
against the management
for the last six years is
good and that Govt
knew the management
had been faulty and
so asked for Mr Lawson
to set it right, & to inaugurate
a more scientific style of management.

FOR ORDERS.

As to a propagating the Cinchona Gardens Never had one as ought to Mr. Lawson will Doubtless ask for one on the suggestion made if he thinks it necessary.

p: 26

There has never been any doubt as to the object for which the Cinchona Enterprise was undertaken. Govt. have repeatedly affirmed all Dr. Hamilton says and more. The only question is that as a profit has been made why should it not go to the coffers of the Government who made the venture and on this point an answer from the Secy of State is awaited in answer to the letter sent in March last

p: 27

This leads to the most important of Dr. Hamilton's recommendations viz. the necessity for a Quinologist. This suggestion is not now made for the first time since the disappearance of Mr. Broughton

* The Dutch possess the same object but do not object to the splendid profits made

(Tel. 30 March 82. No 119

p. pp 28, 29 & 30

† p: 31. F.O. 29 Aug 81 No 1280. Colonel Addams Williams

Mem. Dec. 81 Such an application has been often made for a few ounces of Cinchona seed for the Botanic Gardens Calcutta and Sydney requesting a decision on the point remarking that it was deemed by the Secretary of State consideration and again called attention to the Correspondence on the Peruvian Bark Cinchona between Mr. Addams Williams & the Secretary of State on the subject in 1877 when it was thought there was no necessity for a Quinological

The Secretary of State in reply to the first letter remarked that the desired information could be obtained as well better & in London and that it was unnecessary to make any experiments here as under the new (the latest) arrangements the bark was to be converted into Quinine and alkaloids on account of Government not sold as heretofore.

Again in replying to the second letter dated Hastings said that

† Dec. 81 No 16

" 21st Dec 81. No 16

* p: 54 to 57 F.O. 26 Feb 82 No 463.

F.O. 13th Dec 81, No 1927

There are some very forcible observations — to the same effect as Dr. Hamilton's — as to the importance of having a skilled analyst on the staff of the plantations, and as to the benefit which the Java plantations derived from Dr. Moens employment in that capacity. in the book on Cinchona plants by Dr Van Gorkom just received from the India Office. The Volume should be circulated with this note.

W.A.

he did not propose to
take any steps towards
completing with this request
till he obtained the further
views of this Govt on the
question how this matter
should be disposed
It seems probable that
that the Secy of State
will not sanction the
appointment of a Quinologist
as long as the present
system ~~of~~ offers any
hope of some manufacture obtaining
and this accordingly
recommended to adopt
Col Strachey's
scheme for establishing
a Quinine Manufactory
certain concessions are
granted by Govt for the
purpose of doing what
is done at home.

The Govt moreover
announced the selection
for consideration and G.C. 19 June/82. No 872
Lord Kimberley admitting
the importance of encouraging G.C. Bric: d 12/7/82 Govt remarks
local manufacture in
all cases and specially

S.C. 19th Feb 1883 No 11.

Note with G.C. 19 Aug/82. No 872

in that of quinine, said
he could not entertain
proposals tile it was proved
that the local manufacture
of quinine is possible and
His Lordship resolved to
await Mr Lawson's views
on this and on other points
regarding the management
of the Plantations.

It seems then that
on this question
Mr Lawson's views
should be obtained
and an answer
awaited on the subject
of the Chinchona Credits.
In submitting for Orders
Col: Strachey's proposals
the fact the the superior
profit obtained by manu-
facture in England
did not come into the pockets
of the local Government
as was not urged as a factor
in the decision perhaps too
Govt would wish to have
the views of Dr Bidie &
Cornish members of the
Chinchona Committee of
1878 on the question of local
manufacture.

The last thing to be done is to arrange with the Darjeeling merchants & Planters that the Government will no doubt adopt and it only remains to say that Govt have already arranged for 4 persons to go with the Colonel and that the remainder will probably go in March next at various intervals, and that they have agreed recently to give up the wood (much less like Hooker) & to take little or no duty for 5 years. What Rewards the Indian Officials may decide" are to be the future of Chinchona.

p. 82

*(Govt. of India 8 Aug/82, No 806
" 22 Dec/82, No 1473

p. 81.

G.O. No 4 Dec/82 No 882

The arrangements made however for experiment with the warmer climate Chinchonas are not very satisfactory or definite & Prof. Mr. Dawson should perhaps be directed to confer with the Forest Depart. as to para 31 of Dr. Trimen's report, a copy of which has already been sent to H.E. The Governor.

26/7/83.

It is a favourable indication that from Kew as to always

P.S. 207

As to the importance of having a Gumologist the following pages in Van Gorkom's book may be perused. pp: 84 — 89.
" " Cap: VIII (in which also reference is made to a work by Herr Moens soon to be published which can be obtained).
" " pp: 125. 126.

Since this note was written (Rev: no: 4693) the Report of the Bengal Plantations has also been received. They keep a Gumologist (Dr. Kuig is acting) at only Rs: 200 a month apparently & they review the financial results with great satisfaction. Van Gorkom however (p: 229) doubts if they are right but serves their object is not financial gain it is probable that his financial criticism will hardly hold good.

The fact that they work up themselves the greater part of their bark is of importance with reference to Col: Henderson's proposals but their factory is a Govement Factory tho it is by no means certain (or at all likely) that the same good results would be got from Col: Henderson's proposals for a private Factory. The Chinchona Committees reasons founded on the character of the (officials) Factory have also to be considered.

29/7/83.

Cinchona Plantations

Dr Spruce's Report on

Cur: no: 5769

Refer to Lawson certainly & I think also to Broadwood for an early answer.

MSS

The Hon: Mr Sullivan,
The Right Hon ble
The Governor.

O.M. 16th August 83 no: 282

Mr Lawson replies to the reference made to him on Dr Trimen's report & also reports on the condition of the Cinchona Plantations.

Yes Mss

I Dodabetta

The director asks for orders for coppicing or uprooting Waces. It is suggested he should be advised to use his own discretion in the matter trying to turn the operation to account as an experiment as far as possible.

Neddavalum.

A probable slight decrease in harvest is expected for some years. Mr Pass has reported a probable large decrease.

Hookerwood

Mr Lawson recommends the abandonment of these estates. Dr Trimen thought their retention of little use except for the profit made by sale of the bark. Mr Pass gave the same account of the neglected condition they are in that Mr Lawson does.

Perhaps however Govt will not decide to abandon these estates at this juncture. It will be far easier to come to a decision on

C 30-7-83.
13-8-83

assistant

I agree—Mr Lyons
I do not see that Mr Lawson
can be spared from
Ceylon

G.O. 15th Aug 1882 no: 852.

on this point when other questions of principle were subjudice had been settled. In Aug: 1882 the Govt decided to retain the wood estate till the views of the India office & Kew had been obtained as to the future of Cinchona.

Dr Trimen's Report:

(a) Botanical.

Govt. adopts Dr T's views.

(β) Practical Suggestions.

Necessity for a propagator.

Mr Dawson reports there will be no need to send home for another gardener. The existing employés can do the work.

Quinologist

Messrs Dawson & Trimen are agreed (apparently) the appointment of a Quinologist might be demanded & defended on scientific grounds, for scientific culture apart from the question of the disposal of the crop or the establishment of a local factory. The questions are however intimately connected especially as the Secy of State said in 1881 that a Quinologist was unnecessary as long as the bark was worked up at home.

Agreed

Agreed—Mr Lyons
I do not see that Mr Lawson
can be spared from
Ceylon

Govt. 15th Aug 1882 no: 852.

Agreed on understanding that if the Quinologist ~~selected~~ proposed is not a paid man working under Mr Lawson it would be best to put up for the post for the private Cinchona Planters. The actual selection of the Quinologist & fixing of pay &c &c to be left to the Secretary of State

Govt. 13th Dec 1881 no: 1927

in the letting of
of which Chemistry Botany
& Horticulture record
work to [illegible]. Mr Lawson
supplies the Botanical Science
& Horticultural Art but he
must get a Chemist from
home

Since Mr Broughton was appointed Quinologist, it is believed, several persons have applied for one such means have attained the necessary knowledge to fill [illegible] appointment

£500 a year outside. Mr Lawson has only £600 a year

From Mr Dawsons late memo: however it may be inferred that the future disposal of the crop is an open question the continuance of local sales is an additional reason for the appointment of a Quinologist. Mr Broughton drew £1000 a year. Query if the Plantations can afford this?

Local Manufactory of Quinine &c

Mr Dawson favours Col: Henderson's scheme, a private factory as against a Govt factory like that in Bengal the concessions* proposed to the Company are very moderate. But he thinks the Quinologist should be a servant of the Company doing such work as Govt might want done. It is submitted he must necessarily be the servant of Govt but might on every score with advantage be permitted the free exercise of private practice. With reference to the general arguments used, the Govt appointed Mr Broughton on scientific principles to discussed with him on commercial principles which now again [illegible] to be relegated to the 2nd place. The Cinchona Committee recommended the cessation of local manufacture because of the waste it entailed. But now if Govt foster a private manufactory

* The question of chemical inspection of factory is inadmissible. The servant of the Company is working for any required specific alcohol in such large quantities will be wanted. The Company might possibly be allowed to manufacture alkaloids without in the premises Govts or Queens — its being taken outside being maintained by them. But the industrial establishments which new alkaloids have to pay duty, & on principle it would be difficult to exempt the proposed Quinine factory.

Clerk
Agd

2nd I agree with the remarks of Mr Clerk

I submit that the appointment of English chemist to advocate on the ground of the requirements of scientific culture, experiment & work with Cinchona manufacturing, and the [illegible] requirements [illegible]

with state aid to sell their bark to the manufactory – not however under any guarantee – at market prices – & not at any fictitious price of production – they will anticipate by the ordinary effect of the ordinary operations of trade the fall in the price of cinchona which will take place when private stocks come in, in 2. 3. 4 & 5 years hence. So they will not without any but with the least possible interference to trade, anticipate the end in view – the cheapness of febrifuges for the people of India.

Experiments.

It is probable that Mr. Lawson's proposals (which presume the sale of Wood & Hooker related) may best be considered with the report shortly expected on the arrangements already made for experiments in Malabar. This question does not press like others to be unfolded now.

For orders

The points above referred to on the orders passed on which a letter to Secy. of State will be drafted.

Whether Dr. Riddell's views are to be awaited?

Probably a special reference to Dr. Cornish is unnecessary?

Dr. Trimen's letter in connection with strongly to-
Col Henderson's selection
here in preference to
the Director of the Mint

Always invaluable but Lawson is King.
I think so.

15. 9. 83.
15. 9. 83.

213
Octacamund
July 21st/83

My dear Aubrey

In a letter to Webster
His Excellency expressed his
desire to see Dr Trimen's
report on the Cinchona
Plantations on loan as possible
I therefore send herewith a
copy just received from the
Press. The report will be
circulated afterwards in

Dr Traill's report

A very valuable document. The 1st 5 or 6 pages will I doubt not be taken as a chemist who must make an immediate subordination to Dr Pope's Lancet.

Para 27 will be most important to us when the proctor collaboration becomes more extended — so will 29.

Professor Lauder will be able to say whether any one among the signatures of para 26 can be found on the spot or created. I hope we may rest from it until for another confirmation from Inspectors.

I agree with the first half of 31, & the Professor Lauder in rather opinion on the 2nd part of it.

32. is important.

I cordially disagree with Dr

Natural course of business

Yours sincerely

W. Stokes

My dear Stokes

H.E. has made a

Note on Dr Traill's report

which I return herewith

Yours

Tellow

25th July 1883

Francis Vicu about the
Spelling of Chinchona but
that Mr Markham has
made out a good case
for excepting treatment
of the Vicuña form; but Kew
is against us & it is idle
to kick against the pricks
so Cinchona let it be

MP

25th July 1883

Revenue Department

219

Draft G.B. Confidential

Re. The Governor's note on Dr. Trimen's Report on the Chinchona Plantations

C. No. 4387 — Read letter from Dr. H. Trimen, Director, Royal Botanical Gardens, Ceylon, dated 30th June 1883. [Abstract]

Forwarding his report on the Government Cinchona Plantations on the Nilgiris.

Read also the following O.R., dated 16th August 1883. No. 282 [In full]

" " 5769 — Read also the following letter from M. A. Lawson Esq. Director of the Government Cinchona Plantations, Botanical Gardens and Parks, Nilgiris. [In full]

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The first portion of Dr. Trimen's report which deals with the Botanical problems presented by the Nilgiri Cinchona Plantations would

how he communicated to the officers concerned and to the Editor's Table and will be advertised in the Fort Saint George Gazette for sale to the public. Dr Prineas in common with all other authorities on the subject find Mr Cross to have been altogether wrong on the Succirubra. micrantha question and agrees with the authorities at Kew in considering the varieties locally known as Pubescens and Magnifolia to be hybrids between C. officinalis and C. Succirubra. and both distinct bi-varieties. as held by Dr Bidie. In these conclusions Mr Lawson agrees and by the concurrence of two such distinguished Botanists the correct questions lately discussed abroad may, in the opinion of the Right Honble the Governor in Council be considered to have received as authoritative a settlement as the nature of the case allows.

I say specific because I do not want to take any side officially on the battle between Markham & Kew I quite agree that we must give "force majeure" p: 23 of Report. & write Cinchona but Markham made out a quite exceptionally strong case & after all he is the great grandson of all Indian Cinchona. So let us say nothing officially but quietly acquiesce in Cinchona MSW

G.O. 23 January 1883 & No 294

The Govt entirely agree with Dr Prineas in considering uniformity of specific nomenclature most desirable and desire the Director to adopt the suggestions made on this subject.

The second portion of Dr Prineas report contains some valuable observations upon the principles which should regulate the future management of the Cinchona Plantations. must be considered with the Secretary of States Despatch No 41 dated 21st December 1882, calling for Mr Lawson's views as to the management of the plantations and the best method of utilizing their produce, and with those views set forth in the letter read above. In this connection it will also be necessary to adjust to Colonel Anderson's scheme for the establishment of a private manufactory of

quinine

geneine and cinchona
alkaloids on the Nilgiries.

At the outset it is
necessary to admit that
Dr Spruce's charge that the
Estates have been managed
too much with a view to
revenue cannot wholly be
disproved. This however,
is perhaps a necessary
incident of unscientific
management and the Govt.
cannot with Drs Spruce
and Lawson in considering
that the researches should
be removed by the early
appointment of a geneologist
to work under the orders of
the Director. ~~The cinchona~~
question is full of unsolved
problems in the solving
of which Chemistry, Botany
and Horticulture must
work together. Mr Lawson
supplies the Botanical
science and Horticultural
Art but and a Chemist from
home, who would be of
great service not only to Govt.
but to private cinchona-
growers, is ~~still wanting~~ much wanted

Cinchona cultivation

His Excellency in Council
resolves accordingly to urge
the appointment of such an
~~one~~ expert on the Secretary of State
for the reasons given by
Dr Spruce, which he adopts
in their entirety. This officer,
if appointed, will necessarily
be the servant of Govt. but
he will be allowed the
free exercise of the right
of private practice, provided
that it does not interfere
with the requirements of
Govt, who must have the
first call on his services

It will be convenient
here to append to para 3
of the Secretary of State's
Despatch, a Govt. Gt of 21st
December 1882, and to set
forth the views of this
Govt as to the best method
of utilizing the produce
of the plantations, which
it will be observed from
Mr Lawson's report read
above, will probably be

for lear in the next few than it has been in the last few years. There ~~decrease due to natural causes~~ will doubtless become visible more marked ~~in consequence of the decision at time to adopt a more scientific style of culture and management in future~~. Mr Lawson, it will be seen, is in favour of adhering to the policy of stimulating a local demand for bark by local sales and the Govt are disposed to think that for the present such sales may be continued to the planting community whose stocks will within the next three or four years come into the market. The grounds which would not probably justify more than a lac of rupees per annum would not be sufficient to meet the increased Expenditure entailed by the

with advantage

are concerned

new appointments of a Director and a Quinologist. The remainder of the crop would pending a final decision by the Secretary of State, continue to be sent home to be worked up into quinine and alkaloids or made over to a local factory, as may seem expedient, should a local factory be established.

The purchase of a house for the former & the equipment of a laboratory for the latter, together with other attendant expenses.

Yes. I am still rather vague. I do not see where it is proposed to put a list of Members selected for appointment.

It will here be observed that Mr Lawson is in favour of Colonel Hendley's scheme and proposes certain concessions which Govt might make to enable a private Company to establish a cinchona factory on or near the Nilgiris. In principle the Govt also favour the scheme and should a factory be established, they would be disposing of their

of

it for manufacture at
market prices, anticipate
the fall in prices which
must shortly occur on dec
laring about the end in
view, viz. the production
of cheap fuel for
the people of India, with
the least possible interference
with trade. The concession
of spirit at cost prices would
however be a very large one.
And while that of chemicals
free of duty is inadmissible
With the exception of Alcohol
no duty paying substances
will be largely required
for Alcohol other industrial
Establishments should be
pay Duty and on principle
it would be difficult
to exempt the proposed factory.
It is, however, by no
means impossible that
Govt might devise their way
to making [redacted] a
concessions as may be absa-
lutely necessary to the Esta-
blishment of this industry

Rivers-valuable Timber abound.

227

and further discussion will
doubtless elicit what these
may be, should the Secretary of
State for war dispose to
entertain the proposals
submitted by Colonel Anderson.

It must be noted
that the continuance of
local water and the Esta-
blishment of a local factory
are additional reasons
for the appointment of a
Quinological, though it is
not on these grounds that
the appointment is conceded
necessary, but to meet the
requirements of scientific
culture and Experiment
apart from all questions
of manufacture or of
disposal of crop.

With reference to the
proposed abandonment
of the Hooker and Wood
Plantations, the Govt consi-
der that this question had
better be postponed till
a final settlement of the
various questions of princi-

This is the only part of the draft Report which I do not like - Since I have been at Ootacamund I have visited several plantations in which the trees were in a very flourishing condition. They will have the appearance of age when they are 10 years old, and they will be inspected then. If they are in a flourishing condition

Gov

now subjoined have been arrived at

It is not improbable that the
trees may at no distant period
have to be uprooted and
cultivation here abandoned
in favour of more intense
and scientific culture in
the more favourable Soils
of Dodabetta and Kaduvellum
where cheap skilled Supervision is available.

The Director will use
his discretion as to the
proposed operations at
Dodabetta keeping them
to as economical an Experiment
as far as may be practicable.
His Excellency in Council
agrees with Mr. Lawson
in thinking that no need
exists for extending a
propagator from home
and with reference to his
proposals for Experiments
at Elevations lower than
the existing plantations
resolves to postpone con-
sideration of the subject
from the receipt of a report

for the cultivation
& cultivation
carried on only
in the better situated
Soils

I should like to see
this again when it has
found through
been found

as to what has been done
in the Malabar District,
under orders already issued,
to which it is observed the
reference is made.

Mds

231

REVENUE DEPARTMENT.

No. of 188 .

To

The Right Honorable

The Secretary of State for India.

MY LORD,

With reference to your Lordship's Despatch No. 61 dated 21st. December 1882, and to our letter No. 29 dated 15th. December 1882, We have the honour to forward a copy of Dr. Trimen's report together with a copy of our proceedings dealing therewith and with Mr. Lawson's report containing his views as to the best method of utilizing the produce of the Govt. Cinchona Plantations and as to their future management.

Our views may briefly be stated as follows. We consider the appointment of a Quinologist to be urgently called for as the

as the necessary ~~corollary~~ outcome
of the policy inaugurated by
Mr Lawson's appointment
and in view to the scientific
cultivation and management
of the estates in future.

We think the cabbages
might for the present be
continued; the bark not
disposed of in this way
being sent home meanwhile
pending a decision by your
Lordships as to its ultimate
disposal.

We are in favour in
principle of Colonel Anderson's
scheme for the establishment
of a local manufactory
and should your Lordships
now consider it practicable
the shall be prepared to
enter into negociations in
view to the arrangement
of reasonable concessions
with reference to the remarks
made on this subject in
our Proceedings of this date.
Should the manufactory
be ultimately established,
a portion of the crop will
be made over to it at market
rates for manufacture

We



With reference to the ap-
pointment of a geologist
we have to express our opinion
that this officer must necessa-
rily be the servant of Govt.
and that under no possible
arrangements could Mr Lawson
~~plan~~ plan of a joint geological
in the pay of a private company
answer. In our opinion the
pay offered should not exceed
£500 a year. Mr Broughton
drew £1000, but geologists
have subsequently to his appoint-
ment made great strides and
as the officer ~~appointed~~ selected must work
under Mr Lawson his pay
should be slightly less than
that of that gentleman.

We believe however
that there would be no diffi-
culty in obtaining the services
of a geologist with the
necessary scientific acquirements
for this department, or
even less considering that
private practice will be
allowed.

Ld
24.9.67

WS

26-9-83 № 1189

FORT ST. GEORGE,

(188 ) DEPARTMENT.

Cinchona Plantations

Passes orders on certain important papers concerning the ___ & ordering its despatch ___

Letter to the Right Honorable the Secretary of State for India,

Dated

No. of 188

The Right Hon'ble The Governor
Hon'ble Sullivan
Hon'ble McCarmichael.

C. 21-9-83.
K 22-9-83.
T 22-9-83.
B 24-9-83.
S 24-9-83.
D 25-9-83.

Revenue Department.

Draft C.O

№ 1189 of 26-9-83.

Confidential

6 № 4387

Read letter from Dr. A. Spinner, Director, Royal Botanical Gardens, Ceylon, dated 30th June 1883 [Abstract]

Regarding his proposal on the Government Cinchona Plantations on the Nilgiris.

Read also the following O.M. dated 16th August 1883, № 282. [In full]

" " 5769

Read also the following letter from M. A. Lawson Esq. Director of the Government Cinchona Plantations, Botanical Gardens and Parks Nilgiris [In full]

C.O. Orders

The first portion of Dr. Spinner's report which deals with the Botanical problems presented by the Nilgiri Cinchona

Cinchona Plantations will now be communicated to the officers concerned and to the Editors Table and will be advertised in the Fort George Gazette for sale to the public. Dr. Trimen in common with other authorities on the subject finds his Crosses to have been altogether wrong on the Succirubra hybrida question and agrees with the authorities at Kew in considering the variation so called known as Calisaya and Ledgeriana to be hybrids between officinalis and Succirubra. In these conclusions Mr. Lawson agrees and objections lately discussed in my Note in the opinion of the Right Hon'ble the Governor in Council he considered to have received an authoritative settlement as the nature of the case allows.

The Govt. entirely

agree with Dr. Trimen in considering uniformity of specific nomenclature most desirable and desire the Director to adopt the suggestions made on this subject.

The second portion of Dr. Trimen's report which contains some valuable observations upon the principles which should regulate the future management of the Cinchona Plantations must be considered with the Secretary of State's Despatch, No. 41 dated 21st December 1882 calling for Mr. Lawson's views as to the management of the plantations and the best method of utilizing their produce, and with those Mr. Lawson ~~views set forth in the above~~ and described above. In this connection it will also be necessary to advert to

Colonel

G.O. 23rd January 1883. No. 294

Not clear. Amend
28th March 1883 MSP

Colombo offers advantages
for the establishment of
a private manufactory
of genuine and Cinchona
alkaloids on the following.

All the outlay is
necessary to admit that
Dr Trimen charges the
the estates have been managed
too much with a view to
economy, cannot well be
dispensed. There, however,
is perhaps a necessary
incident of unscientific
management and the Govt
cannot well before Trimen
and Lawson in considering
that this responsibility should
be removed by the early
appointment of a geologist
to work under the orders
of the Director. Cinchona
cultivation is full of un-
solved problems, in the
settling of which Chemistry
Botany and Horticulture
must work together. Mr
Lawson supplies the Botan-
ical element and Horticultural





art, but a Chemist from home
who would be of great service
not only to Govt but to private
Cinchona growers is much
wanted. His Excellency in
Council resolved accordingly
to urge on the Secretary of State
the appointment of
such an Expert ~~on the Secretary~~
~~of State~~ for the reasons
given by Dr Trimen, which
he adopts in their entirety.
This officer, if appointed,
will necessarily be the servant
of Govt, but he will be
allowed the free exercise of
the right of private practice, provided
that it does not interfere
with the requirements of
Govt, who must have
the first claim on his services.

It will be convenient
here to advert to para 3
of the Secretary of State's
Despatch No 61 of 21st Decem-
ber 1882 and to set forth
the views of this Govt as to
the best method of utilizing
the produce of the plantations
which

which, it will be observed from Mr Lawson's report read above, will probably be far less in the next, than it has been in the last few years. Mr Lawson, while he sees, is in favour of adhering to the policy of stimulating a local demand for bark by local sales, and the Govt are disposed to think that for the present, such sales may be continued with advantage to all concerned.

It will here be observed that Mr Lawson is in favour of Colonel Addenbrooke's scheme and proposes certain concessions which Govt might make to enable a private company to establish a Cinchona factory on or near the Nilgiris. In principle the Govt also favour the scheme. The concession of a rent at cost price would, however, be a very large one, which



while that of chemicals free of duty is inadmissible. With the exception of alcohol, no duty appears to be levied. For alcohol other industrial establishments have to pay duty and on principle it would be difficult to exempt the proposed factory.

It must be noted that the continuance of local sales and the possible establishment of a local factory are additional reasons for the appointment of a Botanist, though it is not on these grounds that the appointment is considered desirable but to meet the requirements of scientific culture and experiment apart from all questions of manufacture or of disposal of crops.

With

With reference to the proposed abandonment of the Hooker and Wood Plantations, the Govt. Considers that this question had better be postponed till a final settlement of the various questions of principle now subjudice shall have been arrived at. It is not improbable that the trees in Bandipoor Plantations may at no distant period have to be uprooted and the cultivation carried on under the better situated Estates of Dodabetta and Radumalum, where constant skilled supervision is available.

The Director will now give his direction as to the proposed operations at Dodabetta having them to account as an experiment as far as may be practicable. His Excellency in Council agrees with Mr. Lawson in thinking that no

3

no need exists for getting out a proposal from home, and with reference to this proposed experimental elevation lower than the existing plantations resolves to postpone consideration of the subject pending the receipt of a report as to what has been done in the Malabar Dist. under orders already issued, to which it is observed no reference is made.

(A.C. No of
to the Secty of State)

Ootacamund
26-9-83.

To the Director of Govt. Plantations
Parks & Gardens Nilgiris
16th Board of Revenue
1st Dr. A Primrose.

26-10-83.

100
/6

Page no 245 is blank sheet.



REVENUE DEPARTMENT.

No. 19 of 1883.

To

The Right Honorable

The Secretary of State for India.

MY LORD,

With reference to your Lordship's Despatch No. 41 dated 21st December 1882, and to our letter No. 29 dated 15 December 1882, We have the honour to forward a copy of Dr Lisson's report together with a copy of our Proceedings dealing therewith and with Mr Lawson's report containing his views as to the best method of utilizing the produce of the Govt. Cinchona Plantations and as to their future management.

Our views may briefly be stated as follows. We consider the appointment of a Chemist to be urgently called for as a necessary outcome of the policy inaugurated by

Dated 26-9-83 No. 1189.

Mr Lawson's appointment
and in view to the scientific
cultivation and management
of the estates in future.

We think local aid
might for the present be
continued; the Board not
disposed of in this to any
lengthened home absence before
pending a decision by your
Lordship as to the ultimate
Disposal.

We are in favour in
principle of Colonel Henderson's
scheme for the establish-
ment of a local manufactory
and about to your Lordship
how consider it practicable
we shall be prepared to
enter into negotiations
in view to the arrangements
of the several conditions — terms
with reference to the remarks
made on this subject in
your Despatch of 26th Sept 1855 No 1159.
Should the manufactory
be ultimately established
a portion of the crop will
be made over to it at
market rate for manufacture
With reference to Mr
Lawson's appointment



appointment of a principal
we have to express our opinion
that the office must be
responsible the servant of
Govt and shall use every
possible arrangement to suit
the plan of a joint principal
with the [illegible] a private company
owner. In our opinion the
post offered should not exceed
£500 a year. Mr Broughton
draws £1000, but principal
has, subsequently to his ap-
pointment, made great studies
and as the office should
must work in Mr Lawson
his proper sphere he ought
to be more than that of that gentle
man

We believe moreover,
that there would be no dif-
ficulty in obtaining the
services of a principal with
the necessary scientific
acquirements for the com
mencement or even we
considering that private
practice will be allowed

Colaccamond
October/53

FORT ST. GEORGE,

(188 ) DEPARTMENT.

Cochrane Blackburne

Despatch regarding certain proceedings connecting the — order regarding the despatch of a

Letter to the Right Honorable
the Secretary of State for India,

Dated 8th Sept

No. of 1883.

To be printed urgent ready to be signed & despatched by next mail. Sec's instruction. Please arrange for the paper herewith precedence on the press

10th Sept

1879