

Number of pages 15

Date of issue 22/1/1918

Volume of the Record

MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

GO. NO.	1000	Page
		No.
Date	22/1/18	15

Not to be folded or roughly handled

*Proceedings of the Madras Government, Revenue Department,
17th March 1876.*

No. 169. Read the following letter from Surgeon-Major G. BIDIE, M.B., Superintendent of the Government Central Museum, to the Honorable D. F. CARMICHAEL, Secretary to Government, Revenue Department, Fort St. George, dated Madras, 21st February 1876, No. 31 :—

I HAVE the honor to submit to His Grace the Governor in Council the following remarks on a letter from the Commissioner of the Nilgiris, recorded in Proceedings of Government, No. 1,193, of 19th September 1874. Owing to my absence on furlough these Proceedings have only recently been brought to my notice, and after such a length of time I would not venture to re-open the subject did I not find some of the statements submitted in my Report,

* Recorded in G.O., No. 434, of 11th April 1874. No. 194, of the 15th November 1873*, mis- construed or contradicted. It may also be

mentioned that I am in possession of some additional, valuable, and interesting facts regarding the transfer of alkaloids in plants deserving the attention of Government.

2. Before preparing my report on the Cinchonas I revisited and made a very careful inspection of the estates; and in conducting the inquiry it was steadily kept in view that the industry had all along been in the condition of an experiment, and that it was, therefore, necessary to be very cautious in using or even referring to statements or opinions recorded in its past history, inasmuch as these varied with the results of the hour. In short, a review of the Cinchona records showed that the opinions and supposed facts of to-day were often nullified, if not contradicted, by those of to-morrow, and that it would not be a difficult task to glean statements in abundance to support any view or theory connected with Cinchona culture. That such should be the case will not surprise any one accustomed to biological investigation, as a little further patient inquiry will often disclose a fact that rudely demolishes some conclusion which was apparently firmly based on the observations of years.

3. Keeping this in view, I trusted as little as possible to Cinchona literature, and formed my opinions chiefly on what was plainly visible at the time of inspection. The necessity for this precaution might be illustrated by numerous examples; but I shall only quote one or two which have been selected as having a special bearing on a very important subject still under discussion, *viz.*, the respective merits of *mossing* and *copicing*.

4. At page 43, volume II. of the Cinchona Blue Book, under date the 17th March 1864, the Superintendent of the Cinchona estates reports that the returns from the loppings and prunings of the trees will be the principal source of revenue for many years "to come, especially as the system tried experimentally of removing strips of bark from the stems of the plants has been found to injure their growth, and, therefore, cannot be profitably practised;" again, at page 108, paragraph 34, of the same Blue Book, the Superintendent, in his report for 1863-64, writes: "In collecting our samples of bark, lopping the branches, or cutting down the plants to within a few inches of the ground has been found most advantageous. Removing the bark from the stems of the plants has been discontinued, for, although new bark is formed over the spaces, it is not until more or less decay has been communicated to the wood, and thus the stems are prevented from expanding." Also in connection with this it may be mentioned that, in his annual report for 1864-65, the Superintendent of the estates commended the system of mossing; but that in a letter,

dated the 25th September 1865, which will be found at page 180, volume II., of the Blue Book, he withdrew that recommendation. Such views, it need hardly be said, are quite opposed to those now entertained by the Superintendent of the plantations; and I can only repeat that they instil caution in dealing with even the most recent opinions of the authorities connected with Cinchona culture.

5. In paragraph 4 of the Nilgiri Commissioner's letter under reply, he notices

* See paragraph 16 of my letter recorded in G.O., No. 434, of 11th April 1874.

my remark* regarding some crown-bark trees which were stripped and no moss applied in June 1873, and observes:

"Dr. Bidie does not explain what proportion of bark had been taken from these trees. Four or five square inches were stripped from each." My recollection of these trees is still vivid, and I regret to be obliged to contradict the Commissioner's statement, as long strips proportioned to the size of the stems had been removed in exactly the same manner as the process is carried on by Mr. McIvor. A reference to my report will further show that I did not recommend the practice of this system, but merely mentioned it to show that the application of moss is not, with certain precautions, absolutely essential for the renewal of the bark.

6. In paragraph 6 of his letter, the Commissioner urges the advisability of having trees in plantations as dense as possible, as the nearer the plants are "to each other and the greater the mutual protection afforded, the better the progress of the plantation." This is only true as regards the earlier years of a plantation; it being a universal maxim in forestry to thin out the trees as they grow up so as to give them space to develop. If this be not done, they run up into thin poles, and never well or can become well-formed trees.

7. In paragraph 8, the Commissioner reviews my remarks regarding the gray-bark trees which, as seen on the Nilgiris, I regarded as comparatively worthless. In forming that conclusion I was guided by Mr. Broughton's most recent analyses of this species of bark, and his oft-repeated verbal opinion. Mr. Cockerell expresses surprise that I was not aware that the culture of the gray barks was one of the most interesting experiments proceeding on the plantations, and in support of this he quotes an antiquated opinion of Mr. Howard. To this I can only again say that if stray opinions are to be reckoned of any value in such important question, it would be practicable to convert any point connected with Cinchona culture into an "interesting experiment."

8. In paragraph 10 my estimate of the cost of stripping and mossing the trees is declared inaccurate. On referring to my original statement in paragraph 14 of my letter I find that it has not perhaps been sufficiently clearly stated that my estimate included the cost of collecting and bringing in the moss from the forests, as well as that of the labor of stripping and mossing the Cinchona trees. That such was my intention should, however, have been clear to any one acquainted with the subject, and my estimate still holds good, as it will be observed that Mr. Cockerell's interpretation of it excludes the primary cost of the moss which is very considerable. Mossing is therefore and must continue to be an expensive process.

9. In paragraph 12 of Mr. Cockerell's letter allusion is made to a group of 2,000 *Succirubra* trees which "have excited much controversy" on account of their failing to renew their bark; and it is stated: "Dr. Bidie, I know, devoted his

attentions when he was drawing up his report to the part of the plot where the workmen commenced." This statement is, I regret to say, opposed to fact, as the inspection of the trees was commenced by me at some distance from the outside where the coolies began work and carried in a straight line, taking a tree at intervals, right across the plot. The statement, therefore, made by me, *viz.*, that 82.5 per cent. of this group of trees had in two years failed to completely renew their bark, was absolutely true and a fair estimate at the time the examination was made.

10. In paragraph 16 of his letter, the Commissioner discusses the subject of coppicing, and appears to have misunderstood my recommendation as to the number of shoots which should be left to grow on the stools. A reference to paragraph 27 of my report will show that it was considered a point of great importance that all the shoots, "save one or two of the most vigorous, should be carefully removed." The forty trees on Kilgraston Estate referred to as having been coppiced in alternate rows were not treated in the manner recommended by me. It seems doubtful, indeed, from his remarks, if the Commission can have seen those trees as they were cut out, not in alternate rows, but in a single row in a part of the estate where the remaining trees are so tall and dense as to completely bury the stools in shade. Coppicing conducted in this manner could only have one result, *viz.*, failure.

11. In paragraph 17 of his letter, the Commissioner estimates the probable yield of bark from coppiced trees; but as we have not hitherto had a fair trial of this system, his figures can hardly be relied on. I would, therefore, take the liberty of recommending that information regarding coppicing be obtained from the Superintendent of the Bengal Cinchona Plantations, where the system has, I believe, been exclusively practised.

12. In paragraphs 20, 21, and 22, the important and interesting subject of the transfer of the alkaloids from the old untouched bark on the upper parts of the tree to the new bark renewed under moss is discussed by the Commissioner. Before noticing his remarks on this point, I would bring to the notice of Government a very remarkable example of this kind of transfer which was noticed and verified in 1837 by the celebrated Chemist Dr. (now Sir William) O'Shaughnessy. I give in an Appendix, to which I beg to refer, his own account of the discovery, but take the liberty of presenting here a brief summary of the leading facts. In the year 1836, while examining the Loranthaceæ, the family of parasitical plants to which the English Mistletoe belongs, Dr. O'Shaughnessy accidentally discovered that a species found growing on *Nux vomica* trees near Cuttack possessed all the properties of the supporting tree. This fact was well known to the natives of the district, who regarded it as poisonous in small doses, but used it in the treatment of certain diseases. Dr. O'Shaughnessy made various experiments on the lower animals with the powder of this peculiar parasite, and found that in three-grain doses it produced in them all the symptoms of poisoning by strychnine or *Nux vomica* seeds from which strychnine is prepared. He then analysed the plant and found that it contained strychnine and brucine, the active principles of the *Nux vomica*. It may be added that the Loranthaceæ in their natural state contain neither strychnine nor any other active principle.

This very lucid and conclusive proof of the transfer from the *Nux vomica* tree to a parasite growing on it of the alkaloid strychnine, which is almost identical in its

chemical composition with quinine, requires little or no comment. It must, however, be pointed out that the difficulties in the way of the transfer of an alkaloid from a tree to a parasite growing on it are infinitely greater than those which would obstruct transfer from one part of a tree to another, as in the case of a Cinchona plant. The chief obstacle to transfer in the case of a parasite lies in the fact that there is no absolute interlacing of fibres at the point of union between the parasite and the tree on which it grows, but a firm sort of mechanical adhesion; and there is a further difficulty in the circumstance that the two plants have no family or physiological affinity. And here a remark by Mr. Cockerell as to the influence in grafted trees of the stock upon the graft and *vice versa* may be appropriately noticed. He states, in paragraph 21, that the one has no influence whatever upon the other, and by a reasoning process, which I cannot follow, infers from this that the transfer of alkaloids from one part of a plant to another is impossible. In support of this view he refers to "Dr. Lindsay" (query Dr. Lindley) as an authority. If the distinguished Botanist Dr. Lindley be the "eminent authority" referred to, I must say that the Commissioner can never have consulted Lindley's chief work on this subject, as he gives in it quite a contrary opinion. But there is an older authority on this point than Lindley, and who is quoted by him; I refer to St. Paul who, in his epistle to the Romans, says: "For if thou wert cut out of the olive tree which is wild by nature, and were grafted contrary to nature into a good olive tree, how much more shall these which be natural branches be grafted into their own olive tree." This refers to a custom of grafting wild olive branches on to the trunk of a good olive tree to promote fruitfulness, while, at the same time, the better qualities of the cultivated stock were communicated to the graft.

13. Having thus shown not only the possibility, but the actual occurrence of the transfer of an alkaloid in living plants, it remains to notice briefly the Commissioner's review of Mr. Broughton's investigations which were instituted with the view of testing the theory of transfer. It being impossible to set aside the results of the analyses, Mr. Cockerell endeavours to reduce their value by pointing out what he considers an error in the mode of conducting the experiments. To make this matter quite clear, it must be stated that in my suggestion of the possibility of transfer it was pointed out that the bark renewed under moss was probably enriched at the expense of the old bark left intact on the upper parts of the tree. Allusion to the strips of old bark left on the trunk in the mossing process was carefully avoided, because they are of necessity covered with moss during the renewing process. The effect of this covering on these strips of old bark is to promote in them an increased development of cellular tissue and deposition of alkaloids. In short, these strips are also in an unnatural condition, and the seat of unusual activity as regards the development of cells and the deposits they contain. In consequence of this activity these strips, while under moss, will also, to a certain extent, draw upon the unmossed bark on the upper parts of the tree, and enrich themselves at its expense. If Mr. Broughton had, therefore, confined his investigations to these strips, as proposed by Mr. Cockerell, his analyses would have been of no value whatever as regards the point at issue. I would, therefore, respectfully solicit the reconsideration by Government of the results of these analyses, as given in paragraph 11 of Mr. Broughton's letter, No. 63, of 4th March 1874, recorded in Proceedings of Government, No. 434, of 11th April 1874. It will

be observed that he conducted five distinct experiments, each involving a double series of analyses, *viz.*, that of bark from the upper part of trees renewing bark under moss, and that of bark from the upper part of trees which had not previously been touched. Every possible precaution was taken to avoid any source of error; the trees in each experiment being of the same age and species, and, in fact, differing in no respect whatever, except that in the one series a portion of the bark had been stripped off and was in course of renewal. And here I would crave special attention to the results. In every instance the bark taken from the upper part of the trees which were renewing bark on the lower part of their stems was found to contain a much smaller percentage of alkaloids than the bark of those trees which had never been touched before. To my mind these experiments have all the rigour and force of a mathematical problem, and lead to the unavoidable conclusion that bark renewed under moss enriches itself at the expense of the old bark on the upper parts of the tree. To suppose that in five such experiments, involving at least ten analyses and embracing a large number of trees, the uniform results in each case were due to chance is beyond the range of possibility. The doctrine of chances itself is all against any such fortuitous uniformity. Should the Government still have any doubts in the matter I would suggest that some independent party, say the Conservator of Forests, be instructed to collect specimens of bark in the same manner as was done by Mr. Broughton for his experiments,* and that

these be sent in sealed packets to Mr. Howard for analysis. The bark of Government, No. 434, of 11th April 1874. from parts of the trees which have never been covered by moss, and the trees must, in each case, be of the same age and species, so as to avoid every source of error.

14. I will only trouble Government with one remark more. In speaking, in paragraph 28, of the little injury that the Cinchonas suffer from the barking and mossing process, the Commissioner remarks: "Analogy does not indicate stripping as destructive, as cork trees have been stripped for centuries without harm." This is a most unfortunate analogy as regards the point at issue, as cork, being the outer *effete* portion of the very thick bark of the cork-oak, is removed without even touching the living inner bark of the tree. In fact, owners of cork trees exercise the greatest care to avoid injury to the inner bark, as, if this happens, it causes serious loss in future years and often kills the trees. In conclusion, I would apologise for the length of this letter. In preparing it as well as my previous report, I have had but one object, *viz.*, to place before Government a plain statement of facts connected with Cinchona culture, and my own opinions regarding these.

ENCLOSURE No. 1.

SUPPLEMENT.

Extract from Sir W. B. O'SHAUGHNESSY'S Bengal Dispensary, page 375.

No medicinal properties of any importance had been observed in these plants until we accidentally discovered, in 1836, that the viscum found on the *Nux vomica* trees of Outback possessed all the properties of the supporting tree. As we believe the occurrence has attracted some attention, and is of considerable interest in botanical physiology, we deem it necessary to state the particulars in detail.

2. In 1837, Lieutenant Kütze, then with his regiment at Outback, received information of the existence of a parasite on the *Nux vomica* trees, to which extraordinary medicinal powers were

Proceedings of the Madras Government, Revenue Department,
17th March 1876.

attributed by the natives. They called it *Kuchila kemulung*, held it to be an extremely powerful narcotic and poisonous in small doses, and they used it in the treatment of agues and rheumatism. Mr. Kittoe having procured specimens of leaves sent them to the Editor for experiment.

3. Given in three-grain doses to dogs and kids tetanic spasms set in, in the course of from five minutes to a quarter of an hour, recurring at intervals, and proving fatal by fixing the diaphragm and causing asphyxia. The convulsive movements were precisely the same as those occasioned by strychnine, brucine, and the *Nux vomica* seeds or bark.

On analysis the powdered leaves yielded—

Green coloring matter and fibre	64
Wax	4
Strychnine	1
Brucine	3
Extract	18
Saline matter and resin	10
	100

4. Specimens of the leaves were referred to Dr. Wallich, who supposes them to belong to the *Pisonia monacum*; but no fruit or flowers having been obtained, this point is not yet clearly ascertained. Mr. Kittoe subsequently favored us with a branch of the *Nux vomica* tree in which the parasite was firmly rooted, but as neither fruit nor flowers were present the difficulty in identifying the species was not removed.

The powder of the dry leaf has been used with complete success as a substitute for strychnine and brucine in the treatment of tetanic spasms. The precautions observed in using strychnine and *Nux vomica* are equally necessary with this remedy; it should be omitted as soon as tingling or spasmodic contractions are observed.

(True Copy)

(Signed) G. BIDIE, M.B., Surgeon-Major,
Supr., Govt. Central Museum.

No. 170.

ORDER THEREON, 17th March 1876, No. 384.

Miscellaneous

Dr. Bidie will be thanked for his letter which will be recorded. It will receive consideration hereafter with

other important papers on the *Cinchona* question now awaiting disposal.

(True Extract)

(Signed) D. F. CARMICHAEL,
Secretary to Government.

To Surgeon-Major G. Bidie, M.B.

Edw. F. B. Bantleman.

N^o 31

Government Central Museum
Madras 21st February 1876.

From

Surgon Major G. Bidie M.D.
Sup^t Government C. Museum

To

The Secretary to Government
Revenue Department

Sir,

I have the honor to submit
to His Grace the Governor in Council,
the following remarks on a letter
from the Commissioners of the
Mylabrees, recorded in Proceedings
of Government M^{ts} 93 of 19th September
1874. Owing to my absence on furlough
these Proceedings have only recently
been brought to my notice, and after
such a length of time I could not
venture to re-open the subject did I
not find some of the statements
submitted in my report, M^{ts} 94 of

* recorded in G.O.
of 11th April 1874

the 15th November 1873, inconsistent in
construction

Govt. of 1870th Edition.

REVENUE.

THE SECRETARY TO GOVERNMENT.

Printed at the

Press

GOVERNMENT PRINTING OFFICE.

U.S. B.C.H.

No. 109-170

Original Manuscript - Remains of the
last edition - and containing the latest
corrections with other important
changes printed in new type.

contradicted. It may also be mentioned
that I am in possession of some ad-
ditional valuable and interesting
facts regarding the transfer of alkaloids
of plants, drawing the attention
of Government.

Before preparing my report
of the Cinchonae I revisited and
made a very careful inspection
of the estates, and in conducting
the enquiry it was steadily kept
in view, that the industry had
not along been in the conditions of
a refinement, and that it was
therefore necessary to be very cautious
in using or even referring to statements
or opinions recorded in its past.
History, even as much as there existed
of the results of the farm. In
fact a review of the Cinchona records
showed, that the opinions and
assumed facts of today were often
nullified

11
nullified if not contradicted by those
of tomorrow, and that it would not
be a difficult task to glean statements
in abundance to support any view
or theory connected with Cinchona
culture. That such should be the
case will not surprise any one ac-
customed to biological investigation,
as a little further patient inquiry
will often disclose a fact that utterly
demolishes some conclusion, which
was apparently firmly based on the
observations of years.

3. Keeping this in view I
trusted as little as possible to Cinchona
literature, and formed my opinions
chiefly on what was plainly visible
at the time of inspection. The necessity
for this precaution is easily illustrated
by numerous examples, but I shall
only quote one or two, which have
been selected as having a special
bearing on a very important sub-
ject.

subject still under discussion, viz.
the respective merits of Mossing
and Coppicing.

At page 48 vol II of the
Cinchona Blue book under date
the 17th March 1864, the Superintendent
of the Cinchona estates reports, that
the returns from the lopping and
burning of the trees will be the
principal source of revenue for many
years to come especially as the
experiment had experimentally of
removing strips of bark from the
stem of the plants has been found
to retard their growth, and therefore
cannot be profitably practised again.
At page 106, para 24, of the same Blue
book, the Superintendent has been
reported for 1864-65, under the collecting
and removal of bark lopping the
branches or cutting down the plants
to within a few inches of the ground
has been found most advantageous.
Removal

13
"Removing the bark from the stems of
the plants has been discontinued,
"for although new bark is formed over
the spaces, it is not until more or
less decay has been communicated
to the wood, and thus the stems are
"prevented from expanding." Also
in connection with this it may
be mentioned, that in his annual
report for 1864-65, the Superintendent
of the estates commended the system
of mossing, but that in a letter dated
the 25th September 1865, which will be
found at page 180 vol II, of the Blue
book, he withdrew that recommendation.
Such views it need hardly be said
are quite opposed to those now
entertained by the Superintendent
of the plantations, and I can only
repeat, that they invite caution in
dealing with even the most recent
opinions of the authorities connected
with Cinchona culture.

Railgham

5. In para 4. of the Commissioner's letter under reply, he notices my remarks* regarding some crown bark trees, which were stripped and no more applied in Jan 1873, and observes "D^r Reid does not explain what proportion of bark had been taken from these trees. Thus a few square inches were stripped from each." My recollection of these trees is still vivid, and I regret to be obliged to contradict the Commissioner's statement, as long strips proportioned to the size of the stems had been removed, in exactly the same manner as the process is carried on by Mr. McJannet. A reference to my report will further show, that I did not recommend the practice of this system but merely mentioned it to show, that the application of moss is not with

* See para 16 of my letter recorded in G. O. P. 434 of 17th April 1874

certain

certain precautions, absolutely essential for the renewal of the bark.

6. In para 6 of his letter the Commissioner urges the advisability of having trees in plantations as dense as possible, as the nearer the plants are to each other and the greater the "mutual protection afforded the better the progress of the plantation". This is only true as regards the earlier years of a plantation, it being an universal maxim in forestry to thin out the trees as they grow up, so as to give them space to develop. If this be not done they run up into thin poles and never will or can become well formed trees.

7. In para 8 the Commissioner reviews my remarks regarding the grey bark trees which, as seen on the Railghams, I regarded as comparatively worthless. In forming that conclusion

I was guided by Mr. Broughton's most recent analyses of three species of bark, and his oft repeated verbal opinion. Mr. Lockrell expresses surprise that I was not aware that the culture of the grey barks was one of the most interesting experiments proceeding on the plantations, and in support of this he quotes an antiquated opinion of Mr. Howard. To this I can only again say that if such opinions are to be reckoned of any value in such important question it would be impracticable to correct any points connected with Cinchona culture, into an "interesting experiment".

In para 10 my estimate of the cost of shipping and moving the bark is declared inaccurate on referring to my original statement in para 14 of my letter I find, that it has not perhaps been sufficiently clearly

17
clearly stated, that my estimate includes the cost of collecting and bringing in the moss from the forests, as well as that of the labour of stripping and moving the Cinchona trees. That such was my intention should, however, have been clear to any one acquainted with the subject, and my estimate still holds good, as it will be observed that Mr. Lockrell's interpretation if it excludes the primary cost of the moss, which is very considerable, moving is therefore and must continue to be an expensive process.

9. In para 12 of Mr. Lockrell's letter allusion is made to a group of 2000 *Lucianella* trees which have "excited much controversy" on account of their failing to recover their bark, and it is stated: "Dr. B. B. B. devoted his attention when he was drawing up his report to this point."

of the plot where the workmen commenced." This statement is I regret to say opposed to fact, as the inspection of the trees was commenced by me at some distance from the outside where the earlier began work, and carried in a straight line, taking a tree at intervals, right across the plot. The statement therefore made by me, viz. that 82.5 per cent of this group of trees had in two years failed to completely remove their bark was a wholly untrue and a false estimate at the time the examination was made.

10. In para 16 of his letter the Commissioner discusses the subject of unpleasantly appearing to have misunderstood my recommendation as to the number of shoots which were left to grow at the estate. A reference to para 9 of my report will show that it was considered a point

Suspect the trees - the failure may be due to the fact that the trees had been very small & the bark was thin. The Commissioner's statement is a fair trial of this system, his figure of 82.5 per cent is a fair trial of this system, his figure of 82.5 per cent is a fair trial of this system.

17
of great importance that all the shoots "save one or two of the most vigorous should be carefully removed." The 40 trees on Kilgraston estate, referred to as having been coppiced in alternate rows, were not treated in the manner recommended by me. It seems doubtful indeed, from his remarks, if the Commissioner can have seen those trees, as they were cut out, not in alternate rows, but in a single row in a part of the estate where the remaining trees are so tall and dense as to completely bury the shade. Coppicing conducted in this manner could only have one result, viz. failure.

11. In para 17 of his letter the Commissioner estimates the probable yield of bark from coppiced trees, but, as we have not hitherto had a fair trial of this system, his figure

can hardly be relied on. I would
therefore take the liberty of recommending
that information regarding affixing
be obtained from the Superintendent of the
Bengal Cinchona plantations, ^{ask to him} ~~of that~~
where the system has, I believe, been
exclusively practised.

12 In paras 20, 21 & 22 the
important and interesting subject
of the transfer of the alkaloids from
the old untouched bark on the
upper parts of the tree to the new
bark removed under cover is
discussed by the Commissioner.

Before entering his remarks on this
point I would bring to the notice of
Government, a very remarkable
example of this kind of transfer,
which was noticed and verified
in 1837, by the celebrated chemist,
Dr (now Sir William) O. Shagburey,
a paper on an appendix to which

I beg to refer; his own account of the
discovery, but take the liberty of
presenting here a brief summary
of the leading facts. In the year
1836 while examining the Soranthe-
acea, the family of parasitical
plants to which the English *Mistle*
belongs, Dr O. Shagburey accidentally
discovered, that a species found
growing on *Macaranga* trees near
Cutback, possessed all the properties
of the supporting tree. This fact was
well known to the natives of the
district, who regarded it as poisonous
in small doses, but used it in the
treatment of certain diseases. Dr O.
Shagburey made various ex-
periments on the lower animals
with the powder of the fruit
peruile, and found that in 3
grain doses it produced in them
all the symptoms of poisoning.

by strychnine, or more-venomed seeds
from which strychnine is prepared.
He then analysed the plant, and
found that it contained strychnine
& Brucine, the active principles of
the more-venomed. It may be added
that the Loranthaceae in their natural
state contain neither strychnine
nor any other active principle.

This very hard and conclusive
proof of the transfer from the more-
venomed tree to a parasite growing
on it of the alkaloid strychnine, which
is almost identical in its chemical
composition with Quinine, requires
little or no comment. It must,
however, be pointed out, that the
difficulties in the way of the transfer
of an alkaloid from one plant to a
parasite growing on it, are infinitely
greater than those which would
be met with from one part of a
tree to another, as in the case of a Cinchona
plant.

and there
is no fact
which is
not

23
plant. The chief obstacle to transfer in
the case of a parasite lies in the fact,
that there is no absolute interlacing of
fibres at the point of union between
the parasite and the tree on which
it grows, but a firm sort of mechanical
adhesion, and there is a further diffi-
culty in the circumstance, that the
two plants have no family or phylogo-
gical affinity. And here a remark by
Mr Cockrell as to the influence in
grafted trees of the stock upon the
graft and ~~vice versa~~ may be appro-
priately noticed. He states, in para-
21, that the root has no influence
whatever upon the other and by a
reasoning process, which I cannot
follow, infers from this that the
transfer of alkaloids from one part
of a plant to another is impossible.
In support of this view he refers to
"Dr Lindley" (quoting Dr Lindley)
as an authority. If the distinguished
botanist

betwixt Dr Lindley & the eminent
authority referred to I must say that
the Commissioner can never have
consulted Lindley's chief work on
this subject, as he gives in it quite
a contrary opinion. But there is
an older authority on this point than
Lindley, and who is quoted by him,
I refer to St Paul, who in his Epistle
to the Romans says "For if thou wilt
cut out of the Olive tree which is wild
by nature, and was grafted contrary
to nature into a good Olive tree, how
much more shall these which be
natural branches, be grafted into
thine own Olive tree." This refers to a
custom of grafting wild olive
branches on old decaying good olive
trees, to promote fruitfulness, while
at the same time the better qualities
of the cultivated stock were com-
municated to the graft.

19. Having thus shown not
only the possibility, but the actual

occurrence of the transfer of an
alkaloid in living plants, it remains
to notice briefly the Commissioner's
review of Mr Broughton's investigation,
which ^{were} instituted with the view of testing
the theory of transfer. It being
impossible to set aside the results
of the analyses Mr Cokerell endeavored
to reduce their value, by pointing
out what he considers an error in
the mode of conducting the ex-
periments. To make this matter
quite clear it must be stated, that
in my suggestion of the possibility
of transfer it was pointed out, that
the bark removed under moss was
probably enriched at the expense
of the old bark left intact on the
upper parts of the tree. Allusion
to the ships of old bark left on
the trunk in the mossy process
was carefully avoided, because they
are of necessity covered with moss
during

during the renewing process. The effect of this covering on these strips of old bark is to promote in them an increased development of cellular tissue and deposition of alkalioids. In short these strips are also in an unnatural condition, and the seat of unusual activity as regards the development of cells and the deposits they contain. In consequence of this activity these strips while under moss will also to a certain extent harm upon the unremoved bark on the upper parts of the tree, and even themselves at its expense. If Mr. Broughton had therefore confined his investigations to these strips, as proposed by Mr. Cokerell his analyses would have been of no value whatever as regards the point at issue. I would therefore respectfully solicit the reconsideration by Government of the results of these analyses, as given in para 11 of Mr. Broughton's letter No 63 of 4th March.

21
March 1874, recorded in P. G. N. 634 of 11th April 1874. It will be observed that he conducted 8 distinct experiments each involving a double series of analyses, viz that of bark from the upper part of trees removing bark under moss, and that of bark from the upper part of trees which had not previously been touched. Every possible precaution was taken to avoid any source of error, the trees in each experiment being of the same age and species and in fact differing in no respect whatever, except that in the one series a portion of the bark had been stripped off and was in course of renewal and here I would draw special attention to the results. In every instance the bark taken from the upper part of the tree which was removed bark on the lower part of their stems was found to contain a much smaller percentage of alkalioids.

alkaloids, than the bark of these trees
which had never been touched before.
To my mind these experiments leave
all the rigor and force of a
mathematical problem, and lead
to the unavoidable conclusion,
that bark renewed under moss
enriches itself at the expense of
the old bark, on the upper parts
of the tree. To suppose that in five
such experiments, involving at least
ten analyses, and embracing a
large number of trees, the uniform
result in each case was due to
chance, is beyond the range of
possibility. The doctrine of chances
itself is all against any such fortuitous
uniformity. Should the Government
still have any doubts in the matter
I would suggest that some inde-
pendent party, say the Commissioner
of Forests, be instructed to collect
specimens of bark in the same
manner

23
manner as was done by Mr Broughton
* as detailed in his for his experiments,
letter to G. in P. G. and that these be
No 434 of 11 April sent in sealed packets
1874 to Mr Howard, for analysis. These
must of course in mossed trees
be taken from parts of the trees
which have never been covered
by moss, and the trees must in
each case be of the same age &
species, so as to avoid every source
of error.

14. I will only trouble Government
with one remark more. In speaking
in para 28 of the little injury that
the Cincheros suffer from the barking
and mossing process the Com-
missioner remarks, "analogy does
not indicate stripping as de-
struction, as cork trees have been
stripped for centuries without
harm." This is a most unfortunate
analogy as regards the present at-
tention

is removed, as cork, being the outer effete
portion of the very thick bark of
the cork-oak, is removed without
even touching the living inner
bark of the tree. In fact owners
of cork trees exercise the greatest
care to avoid injury to the inner
bark, as if this happens it causes
serious loss in future years, and
often kills the tree. In conclusion
I would apologise for the length
of this letter. In preparing it as
well as my previous reports I have
had but one object, viz to place
before Government a plain statement
of facts connected with Cinchona
cultivation, and my own opinions
regarding them.

I have the honor to be,

Sir,

Your most Obedt. Servant,

Wm. W. S. Surgeon Major
Supt. Govt. Central Museum

This report was not
communicated to Dr. Bidie,
as he was absent from
Hawaii on Honolulu -
A copy was furnished
on the 13th January last -
It is noted that in
Mr. McLean's report on mooring
and before Sir, Dr.
Bidie's views are also
expressed.

With regard to the
question of the transport
of Alkaloids in the
process of removal of
bark under the mooring
process - I would inform
Dr. Bidie that Mr. McLean
has placed some further
information before
him in his letter.
By ~~the~~ now under
the consideration of
Govt. which will be
communicated to
Dr. Bidie when it has
been disposed of. His
request for further
information, may be
considered.

Yours truly
W. H. M.

I would thank Dr.
Bidie and send his
letter - It can receive
consideration when the
whole subject of the
future of our Chinopona
comes under ^{disposal} consideration.
11 Feb 76 W. H. M.

Notes for Order

Relation to Dr

Birdie Report on the

Catchment Plantation

Send to the Bureau

ME 384

R 2/1

from order

1/16

Dr Birdie will be

thankful for his letter, with

all the receipts. He will

receive consideration here

after, in other important

part papers on the Canebrake

plantation now awaiting

his personal

Dr 10/11

1. To the Bureau, Chicago, Ill.

17 March 1876

10/11/76
10/11/76