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[Despatch Abstract.]

Department of Industries.

Recording report on the natural tannins of the Madras
Presidency by ^{Mr} J.A. Pilgrim, the Imperial Tannin Expert.

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GOVERNMENT OF INDIA. 28
INDIAN MUNITIONS BOARD.

No.H-1963 /37.

Dated Santa, the 19th of December 1917

From

The Secretary,

Indian Munitions Board:

FO

The Secretary to the Government of Madras,
Home Department,

Sir,

7. With reference to the correspondence ending with my letter No. H-107, dated the 21st April 1917, I am directed to enclose for the information of the Government

* For a copy of Madras 20 copies of Mr. Pilgrim's "Report on the Natural Tannins of the Madras Presidency".

I have the honour to be,

Sir,

Your most obedient servant,

Asst. Secretary, Indian Munitions Bd.

MS.

Documents accompanying:

20 copies of Mr. Pilgrim's Report.



REPORT

ON THE

Natural Tannins of the Madras Presidency.

BY

J. ADLRED PILGRIM, Esq., L.T.C.,

Tannin Expert to the Government of India.

Under instructions from the Board, I proceeded from Maihar to Madras on 29th August 1917, arriving there during the forenoon of 1st September.

I reported my arrival to the Director of Industries, Madras,—C. A. Innes, Esq., I.C.S.,—the same morning, and later visited Captain Guthrie, the Deputy Controller of Hides, Madras.

I understood from Mr. Innes that my tour programme would be arranged in the course of a day or two in consultation with the Senior Conservator of Forests, Madras, (P. M. Lushington, Esq., I. F. S., Conservator of Forests, Southern Circle) and in the meantime Mr. Innes gave me a number of samples reputed to contain tannin for preliminary qualitative examination, results of which were briefly as follows :—

(1) *Anacardium Occidentale* (*Kashew-nut tree*).—Tests shewed both

Preliminary Tests at Madras. inner and outer bark contains considerable pyrogallol tannin. Inner bark seems to contain a red dye. The leaves also contain a pyrogallol tannin, but in less proportion than the bark.

I learnt from Mr. Innes—and later had ocular evidence of the great abundance of this tree. I understand that it is equally abundant in all parts of the Presidency. It is used by fishermen as a preservative for their nets. A sample will be sent to Maihar in due course for examination.

(2) *Diospyros embryopteris* (*Tamul ; Panichinga*).—Twig bark contains a pyrogallol tannin. Mature bark contains a considerable quantity of the same.

(3). *Casuarina bark* (*C. equisetifolia*).—Infusion gives blue-black with iron alum solution, pinky-buff with Gelatine-salt solution, and a trace of precipitate with Bromine water : amounts of precipitate with first two reagents indicate a moderate amount of tannin. The *Casuarina* is abundant, being largely cultivated for fuel in Madras, but it is sold by weight, and the bark being left on, realises better prices as fuel, than it could if removed and sold separately for tanning, or manufacture of extract.

Other samples tested at this time included :—

(4) *Sideroxylon tomentosum* indicating a moderate quantity of catechol tannin ;

(5). *Kandelia Rheedii*—a "*Mangrove*"—shewing a moderate proportion of the same class of tannin ; and

(6) *Albizia odoratissima*, of which the outer bark was fairly in tannin whilst the cambium appeared to contain a yellow dye.

N.B.—Nos. 1 and 2 seemed by far the most promising of the foregoing.

On the 3rd October, I went with Captain Guthrie to the Leather Trades

Madras Leather Trades School. School where we met Mr. Innes. This school is well equipped, and the students evidently take much interest in their work. I think the permission to students to provide and tan a certain number of their own skins for themselves has proved a valuable stimulus.

The school is provided with valuable machinery—mostly by T. Haley and Company, Leeds, England,—for splitting, rolling, staking and polishing (latter by Wright). One of the machines can be fitted with special blocks for artificial graining, polishing and other purposes. The laboratory is commodious and well equipped. The large stink cupboard,—a need we must supply at

Maihar,—clears itself naturally from the relatively higher temperature of the laboratory.

Mr. Innes, Captain Guthrie and myself are all in agreement that it would form the ideal centre for Madras, for tannin-research on the lines inaugurated at Maihar. There are pits both of 8 ft. and 4 ft. depth, but the latter depth only would be suitable for tanning tests on Maihar lines; there is ample space for the introduction of the necessary number of additional 4 ft. depth tubs or vats for such work, which, I am convinced, under competent supervision, could be carried on there with success and ultimate benefit to the Tannin Industry of the Presidency.

Electric power for the machines which are direct driven by 4—5 horse power motors is derived from a 10 horse power Diesel crude-oil engine.

Power.

The drying chambers have an overhead arrangement of small "H" girders, the lower flanges of which are perforated with holes at intervals to facilitate the suspension, for drying, of all classes of hides or skins. The larger setting-out tables are made of patent stone; smaller ones, such as the one we have at Maihar, consist of plate glass supported on small girder-frames.

The School has still a stock of direct coal-tar dyes and good work in leather-dyeing has been done by students, whose attention might, however with advantage, in these days, be also turned towards the application to leather of indigenous dyes.

Dyes.

On the 5th October, I met Messrs. P. M. Lushington and Captain Guthrie with Mr. Innes at a sort of informal conference in the latter's office.

Informal Conference at Madras.

Mr. Lushington first read his very able paper on "Tanstuffs of South India," which fully grasps the pressing need existing for cheap and abundant tanstuffs to produce leather for our armies and armaments—for Madras—the recommendations of the Tanning Conference held at Dehra Dun, in August 1917, urging Government control of tanstuff collection at fixed prices in suitable centres adjacent to the rail, and distribution therefrom, in compact form, under a competent Forest officer deputed to the Indian Munitions Board:—in short, a similar system adapted to South Indian conditions, to that initiated by Mr. W. A. Fraymouth of "Esociet" at Maihar, and carried through so successfully by Mr. E. G. Marriott, I. F. S.

Mr. P. M. Lushington's paper.

Mr. Lushington in particular strongly urged the increased collection, and also cultivation of the Avaram or Turwad (*Cassia auriculata*)—the great tanstuff of Madras, and the prevention of its misuse as a green manure, since efficient substitutes exist. He emphasised the need of a Research Factory for Madras, where, for example, particulars for the best time of harvesting the Avaram, and also details of suitable local "dilutents" or substitutes usable to eke out the Avaram could be thoroughly investigated. In this connection he described the present use of the *Casia fistula* in Madras Tanneries and made detailed recommendations—on the lines suggested by Mr. W. A. Fraymouth at the Tannin Conference—regarding its systematic use as well as of that of *Anogeissus latifolia*. I support very warmly his concluding suggestion that in such a factory the expert technical knowledge of Captain Guthrie should be taken full advantage of.

Mr. Lushington had not originally intended to read this paper which he had believed to be already in the hands of Mr. Innes.

Discussion.

The ensuing discussions convinced me that a direct correspondence between the Conservators of Forests and the Director of Industries at the present juncture at any rate, pending the appointment of a Special Forest officer for tanstuffs control and collection would be beneficial in effecting considerable saving of time. I ventured to voice this opinion to the Conference and feel certain that the others present shared my opinion. Mr. Lushington has so thorough a grasp both of present requirements and of the way to meet them, that I could wish that he himself could be asked to take charge of the work, but he has stated it as his opinion that Mr. Whitehead would be a very suitable officer.

The Informal Conference, as reported in Mr. Innes' note thereon, adopted the views expressed in Mr. Lushington's paper regarding the organised collection of Avaram and expressed the opinion that collection in Mysore State—where large quantities of Avaram are being diverted—should also be controlled and brought into line with Madras where a maximum price is now fixed. No maximum prices for Avaram have been fixed in Mysore and the Conference was given to understand that much of the diverted Avaram is for the tanning of sheep skins. Captain Guthrie and I were asked to prepare a definite scheme of practical research, at the Leather Trades School, on suitable "dilutents" and possible substitutes for Avaram. It was further agreed:—

Proposed tanstuff control in Madras.

(i) That failing Captain Guthrie, an officer from the Leather Trades School and a Forest Officer should be deputed to Maihar and Allahabad to study "Porridge Tanning";

(ii) That Mr. Richmond should be asked regarding Wattle cultivation in the Nilgiris and quantities available;

(iii) That other Forest officers should be asked for samples of one or two trees abundant in the Presidency and likely to be of tannin value—attention being paid in sampling to principles laid down in my paper at the Tannin Conference;

(iv) A Provisional itinerary was prepared for my tour in Madras;

(v) Mr. Lushington suggested Mr. Venkatramana Ayyar, District Forest Officer, South Vellore, who is in close touch with tanneries in his District, as a suitable deputation from the Madras Forest Department to Maihar.

On the morning of the 6th September, I visited the Tannery of the Visit to Factory of the Chrome Leather Company at Pallavaram. Chrome Leather Company, at Pallavaram with Mr. Lushington, Mr. Innes and Captain Guthrie.

Mr. Mason, the Manager, showed us the various machines and processes, and I learned with some surprise that this factory was using *no* Avaram at the time. Divi-Divi is largely used in various other additions in mixture including Gambier, Wattles and even Mangrove. The firm do not produce "half-tanned" but finished leather, and Mr. Mason is open-minded enough to be ready to try thoroughly and without prejudice, any new tanstuff that has shown reasonable promise of success. He has already applied a very great variety of indigenous and other tans and is now about to apply "Dhawa Sumac" (prepared at Maihar from leaves of *Anogeissus latifolia*) in place of ordinary "Sumac" in his processes and in various experimental practical tests.

Regarding Mangrove in mixtures, he was inclined to the opinion that it produced less durable leathers than, e.g., Gambier and that defects not noticeable in the newly tanned hides, were apt to manifest themselves in the leather in process of time. I mentioned to him the good results then being obtained at Maihar by Mr. Chowdry with the Mangrove—*Ceriops Roxburghiana*—in conjunction with "Dhawa" leaves as a "bleach."

Before leaving Pallavaram we also visited a tannery devoted to the usual "half-tan" process (hides). This tannery was of the usual Madras type and without any form of machinery.

On the evening of the 6th September, Mr. Lushington and I left Madras for Kodaikanal. The motor-car journey up the Ghat, on 7th September, was several times interrupted for gathering of samples, and at the Forest Bungalow at half-way up the Ghat, we examined two bulk samples of Dhawa leaves prepared by the Forest Ranger, under instructions from Mr. Lushington. One of these consisted largely of red leaves and the other mainly of green. The latter was in

Kodaikanal Ghat.

Mulaiyar.

Anogeissus latifolia.

process of being powdered in a wooden mortar at the time of our visit. Mr. Lushington was at that time without the sieves as used at Maihar for separating the coarser "Dhawa leaves" product from the finer "Sumac" and consequently all sizes of leaves were being powdered to produce his "Sumacs," and

All sizes leaves powdered together.

it was noticeable, that many even of the red leaves in the first named sample, were far larger than those collected at Maihar. But in spite of this proportion of larger leaves, both the pounded samples showed very satisfactory analyses.

The figures calculated to dry "Sumac" were as follows:—

Tannin analyses—	Sample 1 (much red leaf).	Sample 2 (a bright green Sumac).
Tannins absorbed by Chromed Hide Powder	33.14	24.99
Soluble Non-Tannins	16.11	14.98
Insoluble matter	50.75	60.03
Moisture	0.00	0.00
	100.00	100.00

Colour analysis calculated to Standard strength of 5 grams tannin per litre:—

Colour analyses—	Sample 1.	Sample 2.
Red	1.62	3.18
Yellow	6.83	13.07
Black	0.12	0.11

These analyses were carried out after my return to Maihar. I should judge from the figures that the red leaves pure—though, as stated, larger than I have seen hitherto—should give a very good analysis, and I have asked Mr. Lushington to be good enough to provide me with a sample.*

* NOTE.—Such analysis showed: (31st October 1917).

Tannin analysis calculated to the dry material.	Colour analysis calculated to 5 grams per litre tannin strength.
Tannins absorbed by Chromed Hide Powder	Red 1.75
Soluble Non-Tannins	Yellow 5.8
Insoluble matter	
Moisture	
	100.00

I understood that in Kodaikanal districts there seems to be a fresh flush of red leaves about once a month. He has since written me that in the Salem district they are both smaller and less abundant.

The length of the road journey from Kodaikanal Road Station to Kodaikanal is exactly 50 miles, and of these the last 30 miles consist of a gradual climb from—perhaps—1,000 ft. to 6,700 ft. above sea level. Very large quantities of *Anogeissus latifolia* are to be seen for almost the whole distance. The tree grows tall and straight and is very different from the scrub jungle trees of this species I have generally seen in Central India, but there is also a good deal of scrub coppice suitable for ganstuff collection.

Quantities of *Anogeissus latifolia* available.

Mr. Lushington gave me the following list of districts in which *Anogeissus latifolia* is abundant:—

Tinnevely, Madura, West and South Vellore, North and South Salem, Cuddapah, Anantapur, Bellary and South and East Kurnool. In Kurnool alone 2,000 sq. miles contain this tree in great abundance; but Mr. Lushington suggests that the availability of tea labour in the far south of Madras, during the months

Districts in which available.

of June and July, might result in a very large output of Dhawa from the southern districts where it is also very plentiful and "convenient to the rail" in many districts.

The *Phyllanthus emblica* is obtainable in workable quantities in Madura district and most of the districts named above for *Anogeissus latifolia*, but it is more scattered than the last named.

On the journey up to Kodaikanal, we found specimens of *Rhus mysorensis* and collected samples for comparison of its properties with those of *Rhus coriaria* (Italian Sumac). We also took samples of *Grewia tiliaefolia* and *Phyllanthus emblica* (reddish shoots) during the ascent.

Saturday, 8th September, was largely spent in examining samples already collected: the wattle samples being obtained in Kodaikanal itself as they are not to be found below about 5,000 feet.

Experiments with the wattles (*Acacia decurrens*, *dealbata* and *melanoxy-lon*) indicated that in each case the leaves contain practically no tannin. As regards the bark, the tannin content of this increased from the young twig bark, to the mature bark of the main stem. I have since found that Hooper makes 25 per cent. tannin with the upper stem bark, 33 per cent. with the lower stem bark, but only 15 per cent. with the branch bark in the case of *Acacia decurrens*. Experiments must however be tried on the quality of leather produced respectively by twig bark and stem bark, before it can be decided whether the bark which is richest in tannin is also the best leather producer. This does not always follow, but we are expecting to receive samples at Maihar for testing this.

Acacias. *Rhus Mysorensis*—The infusion of the leaves of this shrub yields a precipitate with iron alum and would seem to contain a catechol tannin. The twig bark, on the other hand, contains considerable quantities of a tannin apparently of the Pyrogallol class.

Grewia tiliaefolia.—The red leaves seem rich in a Pyrogallol tan and I am awaiting a sample for complete analysis. Mr. Lushington informed me that this plant is very common around Tinnevely and Coimbatore as well as near Kodaikanal. It coppices very freely and grows well from seed. The wood takes the place of the English ash in India. Mr. Lushington points out that a number of allied species—mostly shrubs—are very abundant and would probably repay investigation.

Other Species. *Phyllanthus emblica*.—The red shoots of this prove rich in tannin but I could not say, meantime, from these rough tests that they are richer than the green mature leaves and twigs of Central India.

On the 9th September, Mr. Lushington and myself made an excursion through the Kodaikanal Wattle Forests and out on to the open "Downs" at a height of approaching 8,000 ft. It was noticeable before leaving the Wattle Forest area that *Acacia decurrens*—the bark of which is richest in tannin of the three mentioned—was almost pure in places and everywhere proportionately more abundant than on the lower levels. Mr. Lushington told me that he was prepared to plant large areas of these bare Downs with this *Acacia* if its value were proved far enough to justify the outlay involved. The quantity of wattle around Kodaikanal at present is altogether insufficient to consider the supply of bark to an extract factory, and I understand does not amount in both Ootacamund and Kodaikanal districts combined, to as much as 200 tons a month. It would only be by very extensive planting that, in some years to come, sufficient quantity would be obtainable for extract manufacture to come into account. In the meantime there is, however, no reason why the bark should not be supplied to tanneries for mixture-tannage, provided the right

Quantity available. **Present possibilities for Indian Wattles.**

Kodaikanal Wattle Forests.

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Quantity available.

Present possibilities for Indian Wattles.

should not be supplied to tanneries for mixture-tannage, provided the right

mixtures for war purposes are arrived at, by experiments either at Maihar or in Madras. The difficulty in the collection of wattle bark would appear to be, that there is very little demand at present for the wood. I am asking Mr. Lushington to send large bulk samples of the Kodaikanal wattle bark for practical experiment to Maihar. But experiments carried out here, so far, by Mr. Chowdry, tend to show that it is more suitable for complete tannage than for the so-called "half-tan."

I questioned Mr. Lushington regarding *Xylia Dolabriformis*, the bark and wood of which would probably be suitable for the manufacture of a tannin extract similar to quebracho, though I am not aware of the use in India of either extract or the raw material, up to now, either in mixture tannage or alone.

Mr. Lushington tells me that it grows thickly in South Kanara where it is to be found "pure" on the laterite hills. Last year 125,000 c.ft., or 3,125 tons of the wood were cut out there, yielding, say, 400 tons of the bark. Probably at least 3 times this amount or 1,200 tons annually would be available now in South Kanara and North and South Malabar. Further, Mr. A. W. Lushington is about to cut large quantities of this tree at Kottiyore. The bark is always just left to rot on the ground and yet would, no doubt, be of present value if near to tannin centres.

I have asked Mr. Lushington to kindly send us samples to Maihar for investigation.

I left Kodaikanal on 10th September for Trichinopoly with my host Mr. P. M. Lushington. On the downward journey we obtained a sample of *Cassia bicapsularis* which was common enough to justify a test at Trichinopoly, but it proved to contain no tannin in any part of the plant.

At Trichinopoly, on September 11th, I visited the principal tanneries with Mr. Lushington, Mr. Raman Menon, District Forest Officer, and Mr. Maiden, Inspector of Tanneries, Southern Circle. In one of them, I found a leather which tore easily except in the thickest parts of the hide, and also much floating leaf-matter in the vats which, possibly on this account, showed considerable evidence of fermentation. The Turwad bark—*Cassia Auriculata*—in use was very much too young. Mr. Lushington considered the shrubs from which it was collected must have been less than a year old. If so, here is a matter for the attention of the Special Forest Officer for Madras when appointed. I may mention that we saw larger stocks of *Cassia fistula* (Konai) than of Turwad in this tannery; but I was informed that this Konai had also gone up in price.

I also learnt that *Cassia marginata* (Sarai Konai) was used admixed with the Konai in this tannery,—I rather suspect indiscriminately,—owing to confusion in the very similar names.

Konai and Sarai Konai. Mr. Lushington had already called my attention to this tree. I should estimate the tannin in the middle redlayer of bark, which is the richest, at something under 10 per cent., but this is a guess based on rough tests. *Cassia marginata* was very plentiful when I went to the south of Madras, and as far as Madura.

Another large tannery I visited at Trichinopoly shewed me fine leather free from the defects noted elsewhere.

I was able to discuss these visits in detail with Mr. Henderson, the War Office representative, at a later date.

In the afternoon of September 11th, I did a number of demonstration tests before eight of the principal tanners of Trichinopoly. It was very evident from

Incomplete extraction of Turwad. these that a very large proportion of the tannin remains in their turwad after extraction—in fact, by rough tests—(Iron alum, gelatine-salt solution and bromine water), it was difficult to distinguish between the fresh and exhaust turwad. All were greatly impressed by the comparative strength of Mr. Lushington's Dhawa Sumacs as against any other tanstuffs tried.

That evening—11th instant—I bade farewell to my kind host Mr. Lushington and left during the night for Muthupet where Mr. Chengappa, the District Forest Officer, South Arcot, was to meet me,—under instructions from Mr. Lushington.

Mr. Chengappa duly met me at Muthupet Station and the next day (13th September) we went down-river to the Mangrove swamps. I had been very anxious to obtain samples of mangroves with which I had been familiar in Borneo owing to our experience there that mangroves from far south,—near

Muthupet mangroves. to the lines—were richer in tannin than those further north. But at Muthupet the mangrove was almost entirely the *Avicennia officinalis* (or "*White mangrove*") which contains very little tannin, the fruit only, showing at all a marked indication with any reagent.

I, however, collected samples of this and a number of other samples, rough tests of which gave the following indications:—

	Leaves.	Bark.	Fruit.
(1) <i>Avicennia officinalis</i>	Trace	Trace	Gives a good indication with iron, but this is not borne out by gelatine salt.
Rough tests of samples collected at Muthupet.			
(2) <i>Ægeciras magnus</i>	Trace	Fair amount of tannin.	Trace.
(3) <i>Clerodendron inerme</i>	Trace (apparently contains yellow dye).	Trace	..
(4) <i>Thespesia populnea</i> (Tulip or Portia tree).	Slight tannin.	Considerable tannin.	...
(5) <i>Odina wodier</i> (a pinky bark).	Considerable tannin.	Considerable tannin.	...
(6) <i>Excoecaria agalloche</i> (Thillai tree).	Considerable tannin of <i>Pyrogallol</i> class in both bark and leaves. These also contain an acid latex which produces sores on the skin.		
(7) <i>Suaeda monoica</i> (salt wort).	I estimate tannin in this plant at perhaps 5 per cent.		
(8) <i>Morinda Citrifolia</i>	None. (apparently contains a red dye.)	None.	None.

All the above samples except No. 4 were obtained along the river banks; No. 1 gradually usurping a monopoly of the ground as we went downstream to the lagoon, all shores of which are surrounded by this tree,—pure.

No. 5, which gave a promising result, is of scattered but very general distribution. Mr. Chengappa informed me that it is easily propagated from

Odina wodier. The bark often flakes off of itself and could, therefore, perhaps, be removed, as that of *Kahua* (*Terminalia Arjuna*), without permanent injury to the tree. I learnt from him, also, that I was likely to find specimens of the mangroves I wanted at Killai,—further north. We, therefore, left Muthupet on the 14th instant sleeping at Coleroon and proceeding on 15th instant by rail to

Killai "mangroves." Killai and thence several miles by road to the creeks.

Here also was more *Avicennia officinalis* than anything else but accompanied by another variety of *Avicennia*,—having a similar fruit but a much blacker stem,—to the extent of about one-fourth of this "swamp." It is known as "*Kari Kandan*" or "*Black Kandan*" whereas the *Avicennia officinalis* is

known as "Kandan" without any adjective. The Kari Kandan gave somewhat better indications of tannin, but an analysis carried out since my return to Maihar was disappointing and a large amount of black in the infusion justified the name "black," as the grey appearance of the bark had not done.

It is unfortunate that the only plentiful mangroves of this district should be of so little tanning value.

The figures of Kari Kandan analysis are as follows, calculated to dry bark:—

Tannin absorbed by chromed hide powder	3.80
Soluble non-tannins	11.62
Insoluble matter	84.58
Total	100.00

Colour analysis calculated to 5 grams per litre tannin strength—Red, 57; yellow, 29.5 and black, 30.5.

A lead (Pb) method analysis showed 5.04 per cent. on dry. The difference is probably accountable for by the gallic acid also precipitated in this method and confirms the relatively good indication with Iron alum not borne out by gelatine and salt.

There are fair quantities of *Sonneratia apetala* in the Killai district and my analyses of the Killai leaves and bark of this species, completed since my return

to Maihar, are as follows, calculated to dry material:—

(1) <i>Bark</i> .—Tannins absorbed by chromed hide powder	8.04
Soluble non-tannins	10.14
Insoluble matter	81.82
Total	100.00

Colour analysis calculated to 5 grams per litre tannin strength:—

Red, 25; yellow, 52.5 and black, 2.

(2) <i>Leaves</i> .—Tannins absorbed by chromed hide powder	8.50
Soluble non-tannins	16.14
Insoluble matter	75.36
Total	100.00

Colour analysis calculated to 5 grams per litre tannin strength:—

Red, 17; yellow, 45 and black, 1.25.

We also obtained samples of *Ceriops Candolleana*, *Bruguiera caryophylloides* and *Rhizophora mucronata*; but

Ceriops Candolleana. these specimens are to be found only here

and there and they are not easy to find.

Analyses figures were as follows, as usual, calculated to the dry material:—

(1) *Ceriops Candolleana bark*:—

Tannins absorbed by chromed hide powder	22.60
Soluble non-tannins	10.72
Insoluble matter	66.68
Total	100.00

N. B.—Chlorides (as NaCl) 1.34 per cent.

Colour analysis calculated to 5 grams per litre tannin strength:—

Red, 28; yellow, 43 and black, Nil.

(2) *Bruguiera caryophylloides*:—

Tannins absorbed by chromed hide powder	18.41
Soluble non-tannins	10.49
Insoluble matter	71.10

Bruguiera caryophylloides.

Total 100.00

Colour analysis calculated to 5 grams per litre tannin strength:—

Red, 13.60; yellow, 30.21.

(3) *Rhizophora mucronata* (the common Mangrove):—

Tannins absorbed by chromed hide powder	22.17
Soluble non-tannins	16.76
Insoluble matter	61.07

Rhizophora mucronata.

Total 100.00

Colour analysis calculated to 5 grams per litre tannin strength:—

Red, 11.74; yellow, 26.85.

I have observed that the bark of the aerial roots of this species contains tannin:—an estimation will be done and reported in due course.

The Mohamedan Headmen of Coleroon and Killai showed me the most unstinted hospitality which was the more appreciated in that it was entirely unexpected.

I returned to Madras on the 16th instant and had an opportunity that day, of discussing my tour—to date—with Captain Guthrie. On Monday, the 17th, I reported my return to the Director of Industries, who advised my proceeding to Cocanada to examine mangroves in that district. He asked me before leaving, to draw up the scheme already mentioned, with Captain Guthrie, for "Porridge"-tanning researches, to be carried out at the Madras Leather Trades School, and this we did on the 18th instant. On the 19th instant, I learnt, on calling at the office of the Director of Industries, that Mr. Latham, the Conservator of Forests, Northern Circle, Madras, had written him that the mangroves of the Godavari, being mostly *Avicennia*, he did not think it would be useful for me to proceed there. In the circumstances, after discussing the matter with Mr. Innes, I decided to leave that evening (19th instant) for Travancore which appeared from Bourdillon's work on "The Forest Trees of Travancore," to be very rich in mangroves. On the long journey a fellow-traveller suggested to me the use of the

Tea—"Fluff." as a tanstuff. This suggestion was repeatedly made to me during my stay in the south of Madras, but

an analysis carried out, on Assam tea-fluff, since my return to Maihar, shews only 8.38 per cent. tannin on dry and the price in Calcutta is quite prohibitive for so weak a tanstuff.

I arrived at Quilon on the morning of the 21st instant and was met by Mr. Subrahmanya Ayyar, the Conservator of Forests, Travancore, and various members of his staff. The former explained that he was obliged to leave that

Travancore.

day for Trivandrum to attend the Jubilee of His Highness the Maharaja; but he, nevertheless, most kindly invited me to visit him at Trivandrum on the 24th morning, so that he could show me the mangroves in Southern Travancore on the following day. In the meantime, he was so good as to place at my disposal, the services of Mr. Vencoba Rao, a Botanist, with a most complete knowledge of his subject. In the afternoon, I visited a large lagoon in the vicinity of Quilon, and in the course of a 10 mile rowing trip collected a number of samples. The mangroves were, however, a mere fringe along the water edge and in the course of the next three

Distribution of Mangroves.

I went in Travancore. No doubt, Travancore was very rich in mangroves

when Bourdillon, the late Conservator, collected his evidence, but, in the meantime, almost all the mangroves have been cut out, coconut and paddy cultivation taking their place. I made every possible endeavour to obtain a boat on the 22nd instant to take me to Trivandrum, but, owing to the demand for every kind of craft to take people to the Jubilee celebration, I was unable to obtain one. I learnt from Mr. Vencoba Rao that even near Trivandrum the mangroves were nowhere very thick, and in his opinion, I should stand an equally good chance northwards as southwards. I, therefore, proceeded that evening (22nd instant) to Alleppey by public motor-launch. On reaching there the following morning, I called upon Mr. G. H. Davey, a prominent business man of Alleppey,—who most kindly gave me letters of introduction to two planters some distance out, and suggested certain places which I might well pay a visit to. He was good enough to allow me to hire his private motor-launch in which I proceeded to the Pallam river. The fringe of mangroves on this river is *continuous*, but thin as elsewhere. We were, however, able to collect a number of samples; after which we proceeded to the

Komarom Estate of G. A. Baker, Esq.

estate of Mr. G. A. Baker at Komarom, Olesha, Kottayam. On my handing Mr. Davey's letter to Mr. Baker, he most kindly offered to show me over his mangroves if I would remain until the day following, and he assured me that he knew the inland waters of Travancore thoroughly, and that, in his opinion, I had come to the only place where any real mangrove-swamp was left. Mr. Baker has a very large estate and already deals with some 150,000 coconuts (from 3,750 trees) annually. But he still has a portion of the estate in which the mangroves are not yet cut out. This swamp is so thick that it is so difficult to penetrate in a 'dug-out':—the principal species to be found there are *Sonneratia apetala* and *Sonneratia acida*. There are, however, a number of other species on the outer banks of his estate both confronting the Vembanad Lake and the Kottayam River. I did not see so thick a fringe anywhere else in Travancore. Mr. Baker was most kind in making excellent "Bandobast" for our visiting his various mangrove swamps and fringes and for collecting the necessary samples; and he and Mrs. Baker were good enough to allow me to utilise their Bungalow for a number of "on the spot" tests. The samples examined were:—

(1) and (2) *Sonneratia apetala* and *Sonneratia acida*.—"Mangroves": The *Sonneratia acida* gave better indications on a rough test than the *Sonneratia apetala* of which an analysis from another source is reported above. The fruit also appears rich in Pyrogallol tan.

(3) *Kandelia rheedii*—a "Mangrove".—Leaves, bark and fruit gave a good indication of Catechol tannin.

The bark, according to Bourdillon, is used as a red dye in Burma (Tavoy). The sample tested here appeared richer than the one I examined in Madras.

(4) *Rhizophora conjugata*—a "Mangrove".—Leaves contain hardly any tannin. Twig bark contains a fair amount of Catechol tannin.

(5) *Rhizophora mucronata*—the common *Mangrove*.—Of which an analysis has already been given—would appear to be much richer in tannin than this *R. conjugata*.

(6) *Eugenia caryophyllia* bark gives a very good indication of Pyrogallol tannin.

(7) *Barringtonia racemosa*.—The leaves of this tree give a perfectly colourless infusion, but on testing, indicate considerable Pyrogallol tannin, which may be of special value owing to the absence of colour. The bark has some colour, but also gives good indication of tannin.

(8) *Hibiscus tiliaceus*.—The leaves and bark show a moderate amount of Pyrogallol tannin.

(9) *Bruguiera gymnorhiza*—a "Mangrove".—shows a fair quantity of Catechol tannin. Another *Bruguiera* giving a blue-black with iron and no precipitate with Bromine water also gave promising indication. I was not able

to get the classification of this. All the foregoing are to be found, here and there, on Mr. Baker's estate, the commonest being the *Sonneratias*, the

Bruguieras and the *Rhizophoras*. None of them, however, would be sufficient to feed an extract-factory though the *Sonneratia* product might be very useful in a local tannery. (I understand that the Travancore Government are

Tannery for Travancore.

training a man to take charge of a Government Tannery in due course). But Mr. Baker would be willing to undertake the planting of *Sonneratias* or other suitable mangroves, which serve as a useful protection outside on the outside of his banks, if sufficient inducement offers. The price of 6 to 8 annas

per maund now paid in Calcutta for

Cocconut fibre for tannin. Goran (Ceriopis) would not tempt him. He called my attention to the tannin in the cocconut fibre which I found to be present in a moderate proportion. This tannin is of the catechol class and I have asked Mr. Baker to send me sufficient cocconut fibre to have it thoroughly tested. If eventually it can be manufactured into extract without damage to the fibre, it might develop into an important 'by-product' of the coir industry.

Other samples collected in the neighbourhood of Komarom were as follows:—

Glochidion Zeylanicum.—Bark, Catechol tannin; leaves Pyrogallol tannin.

Cassia alata leaves and bark.—Contain a yellow dye which dyes silk a golden yellow with addition of Tin-salt. The colour is improved by subsequent soaping.

Further samples.

Deria scandens bark.—Shows considerable Catechol tannin.

Garcinia gamboja bark.—Contains considerable Catechol tannin and a sticky orange-coloured matter.

Odina woderi.—Results confirm those already reported for Muthupet sample.

Lawsonia alba bark.—Shows fair indication of Catechol tan. Leaves appear to contain a yellow dye.

Mr. Davey of Alleppey had been most anxious for me to test the Screw pine (*Pandanus Kaitha*) on account of its abundance in Travancore. Unfortunately, it appeared to contain only Gallic acid, and no tannin. I left Komarom on the 24th evening reaching Brnaculam on the following morning and Madras on the 26th September.

Here I had an opportunity of discussing my tour both with Mr. Innes and

Return to Madras.

Captain Guthrie, and on the day following I was glad to have the chance of a talk with Mr. Henderson, the War Office representative, who, I think doubts the advisability of attempting to introduce any *substitutes* for *Cassia auriculata* in Madras, except in tanneries under European supervision. I told him of my experiences at Trichinopoly and of the mixture with *Cassia auriculata*, of *Cassia marginata* (Sarai Konai) as well as *Cassia fistula* (Konai) in Trichinopoly tanneries; also of the very good Dha-wa in the south.

The researches which will be carried on at the Leather Trades School, Madras, will be with a view to finding

immediate object of Research in Madras. *diluents* rather than substitutes for Turwad, which latter will be tried in intimate admixture with it, in the form of "porridge." I believe this idea has Mr. Henderson's full support. Captain Guthrie has great hopes that by the correct use of the Escot-porridge method with Turwad alone, tanners will already benefit to the extent of most of the odd 7 per cent. tannin they now throw away in the spent bark, which will at once mean a considerable saving in *raw* Turwad. He told me that he would much like to visit Maihar and Allahabad to see the porridge tanning practically applied, and the various results attained, but I have since heard from Mr. Henderson that he cannot well be spared at present from his work in connection with hides.

Noticing when in Madras, that Captain Guthrie was apparently largely employed on office work of a routine character, I felt, in full agreement with Mr. Innes' wish, that the former could devote more of his time to practical research on leather and tanstuffs; but it was evident from my conversation with Mr. Henderson that Captain Guthrie could not exchange his present work for Research work,—handing over to some purely business man,—unless this latter had, at any rate, expert knowledge regarding *hides*.

It does, however, seem, to me that there is more likelihood of finding other men in India with such knowledge of hides as Captain Guthrie's, than with the further knowledge of *tannins in tanning*, possessed by him, but by very few others out here at present; and it is, therefore, my hope that an efficient hide-expert may be found in due course, to release or at least partly release Captain Guthrie for research work at the Madras Leather School which is so much his

Conclusion. Such research will have already fully justified itself, if it results during the present shortage, in any economy, in Turwad, to be achieved either by fuller exhaustion of the tannin in the latter, or by means of its admixture with suitable "diluents."

I found Madras as rich in tanstuffs as any other part of India I have visited, but with this difference that while some districts have an unusual abundance of natural tanstuffs, others are left comparatively poor. I have not touched particularly upon the great tanstuff of Madras, *viz.*, *Cassia auriculata*, Turwad or Avaram, because this is already so well known that it would have been superfluous to do more than refer, as I have done above, to the possibility of making it go further. The other tanstuffs referred to may all find their uses in due course, some of them in the tanneries of Madras; others in the manufacture of extract for more distant centres in India, and for export.

I have to express my special thanks to Messrs. Innes, Director of Industries, Madras, Captain Guthrie, Deputy Controller of Hides, Madras, Subrahmaniam Ayyar, Conservator of Forests, Travancore, and his botanist Mr. Venecoba Rao; Mr. Chengappa, District Forest Officer, South Arcot, and Mr. C. A. Maiden, Inspector of Tanneries, Southern Circle, Madras, and Messrs. G. H. Davey and G. A. Baker of Alleppey and Komarom Kottayam, respectively, for the various arrangements they made which contributed to making my tour as comprehensive as possible.

I hope to send in, in due course, a supplementary report containing figures of analyses of species of which I have only been able as yet to report tests on the rough.

J. ALDRED PILGRIM,

Tannin Expert to the Government of India.

Since signing the above Mr. Naidu, of the Madras Leather Trades School, has arrived at Maihar to study the Esociet-porridge methods.

J. A. P.

NOTES.

Home (E) Dep.

Subject Mr. Pilgrini's "Report on the
Natural Causes of the Madras President

[C. no. 3811] From Indian Munitions Bd. No. 19533/19-12/17



Submitted Copies of the Report
may be communicated to the Officer in Charge
of the Dept. of Industries and the Rev. Dept.
for information and any action they may
consider necessary.

The Rev. Dept. may be requested to
state the no. of copies of the report required
for their selves and their Subordinates.

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9.1.18

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8/1/18

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Rev. no. C

54

7/10.1.18

Revenue Dept.

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Board's office - 2

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Communicate a copy to Mr. Wood.
There appears to be no need to send
copies of the pamphlet to D. F. O. If
the Board gives. Consider it necessary
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The file may be returned to the Home
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11.1.18.
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S. I would like to know whether
for purposes of distribution of
pamphlets, communication of
papers etc, Mr Wood is to
be considered as standing under
the New Dept or under the
Munitions Board.

SL
15/1/18

The go. denoting Mr Wood's position should
be put up.

SL
16.1.18

To Secs

Byo. No. 83 Rev. of 5.1.18 is Subcom. the
Mr. Wood is to work under the Munition
Bo. B. but to keep the Govt. informed —
KLM
16.1.18 generally of the progress of his
investigations.
We have nominated Mr Wood & are

Henry H.
Receivd.

Indirectly responsible for and directly
interested in the results of his work.
We should regard it as our business to
send him any paper that came to
our notice which may affect his
investigation.

Mu
17.1.18

To us

With reference to the Secy's note above
the Home (Educ) Dept may be requested
to furnish this Dept with 9 copies of the
pamphlet, one of which will be sent to
Mr Wood and the rest distributed as shown
at p. 1. infra. With these remarks the
file may be returned to the Home (Educ)
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18/1/18.

Home (Educ) Dept

A draft order is submitted for approval

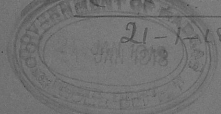
James
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Librarian to note the
distribution.

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C. No. 3811, From the Indian Municipals Bd No. 1953, dated 19.12.1917

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No. 90, dated 28 - 1 - 1918.

Wei:

The "Report on the Natural
Causes of the Madras Prevalence,"
is communicated to the ^{Rev. Secy to the} Officer
in charge of the Dept. of Industries
for information and any necessary
action.

02.1.18

Read & signed
with wife
& notes
Jms
21.1.18

2
The Officer in Charge given
Dypt of Evidence (written report)
a copy of the report
to Dypt of Evidence (written report)
29.1.19

When given for copying

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