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EAST AFR. PROT

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Bowring 491

1917

22 Aug.

Last previous Paper.

P/20546

COFFEE LEAF DISEASE INVESTIGATION

LABORATORY FACILITIES FOR MYCOLOGIST.

Trs report by Mr Dowson. Agrees ast necessity extending present facilities and if possible provision will be inserted in 1918-9 draft estimates.

Mr Read,

We simply must get this provision made in the Estimates for next year. It is a small beginning for the bigger things which Mr Dowson has in mind, and which will have to come in time. Perhaps you would like to send Sir W. Prain the duplicate of the desp: with its enclosure?

J.A.B. 12.10.17

We might send Sir D. Prain officially copy of our desp: on 20546 and copy of this desp: alone: at once.

H. J. R. 12/10/17

SR. to note for Estimates

a subsequent Paper.

to Kew. 18004

(J 16913) Wt. 25722—18. 50,000. 11/16. D A S. G 122/21.

Sir H. Read.

The accept Estimates (sent on to you yesterday) provide £645 for the Laboratory and an additional £50 for apparatus.

? Pirty

W.C.S.
8/6/18

at once.

C. H. R
8/VI/18

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? Pass

W.C.S.

8/6/18

at once.

H. J. R.

8/VI/18

AFRICA PROTECTORATE
No. 491.

GOVERNMENT HOUSE,
NAIROBI,
BRITISH EAST AFRICA.
August 22nd, 1917.

Sir,

Report. 20546

I have the honour to acknowledge the receipt of your despatch No.341 dated the 2nd of May regarding the facilities necessary in the laboratory used by the Government Mycologist for the purpose of investigating the causes of coffee leaf disease.

2. I enclose a report by Mr.Dowson on this matter. The buildings immediately necessary are estimated to cost about £645 while the essential apparatus can be procured for £50.

3. I cordially agree with the desirability for extending the existing facilities for such investigation and provision for this expenditure will be inserted if possible in the draft estimates for the ensuing year.

I have the honour to be,

Sir,

Your humble, obedient servant,

ACTING GOVERNOR.

THE RIGHT HONOURABLE
WALTER LONG, P.C., M.P.,
SECRETARY OF STATE FOR THE COLONIES,
DOWNING STREET,
LONDON, S.W.

AGRICULTURAL DEPARTMENT.

NAIROBI, 27th June 1917. 102

INCLOSURE

in Despatch No. 9 of March 22 1918

The Hon. Director of Agriculture,
Nairobi.

Sir,

LABORATORY FACILITIES URGENTLY REQUIRED FOR THE INVESTIGATION OF PLANT DISEASES.

The investigation referred to in Professor Blackman's letter to Sir David Prain could not be completed at South Kensington owing to the lack of material representing the early stages in the development of Hemileia vastatrix, the cause of the coffee leaf disease.

This rust fungus has not been examined morphologically since Professor Marshall Ward elucidated the cause of the coffee leaf disease in Ceylon in 1882 when microtechnique was not nearly so elaborate as it is at the present day. No published figures exist showing the arrangement and number of the nuclei of the parasitic mycelium and it was my preparation and examination of these and comparison with those of other rust fungi which indicated that continued and similar work on the very young stages of the disease would probably settle the question of the existence of a second host (corresponding to the barberry of the cereal rust Puccinia graminis).

Hemileia vastatrix is undoubtedly indigenous to Africa and probably to this part of Africa. I have collected a number of accidial (the form which occurs on the second host of the heteroecious rust fungi) stages of

unknown

unknown rusts on a variety of native plants; one of these occurred on a species of Leonotis, a very common plant, 103
bordering one side of a coffee plantation. This plantation was infected by Hemileia vastatrix during the two years I had it under observation and it was noticed that the infection started from this particular side of the plantation. I endeavoured to carry out some inoculation experiments on young coffee with this rust both at Kabete and at Nairobi, but the work was unsatisfactory partly owing to the absence of experimental coffee trees of a suitable age near enough my room in the Department to be inspected regularly, and partly owing to the lack of the necessary inoculation apparatus.

This observation of an aecidial stage of a rust fungus on the native Leonotis together with my microscopical work at South Kensington lead me to suppose that a second host for Hemileia vastatrix is quite likely to be present. If this were proved, the destruction of this second host in the neighbourhood of coffee plantations would go far to eradicate the disease from the districts in which it occurs.

But the further investigation of Hemileia vastatrix is not the only case for increased laboratory facilities. There are other fungous diseases of coffee about which we know very little and which have been hitherto put down to peculiar "physiological" or "climatic" conditions. One of these, namely, a stem disease involving the trunk of the trees from tip to ground level is under observation at the present moment; it is fairly wide spread over the coffee growing districts and seems to be increasing in certain localities.

Another fairly wide spread disease of coffee is the coffee leaf curl which has recently come to my notice

and

and wants thorough investigation. 104

There are, further, serious diseases of citrus trees and fruits, the cultivation of which is a new industry in this country. The most important of these diseases, namely, the "scab", the "canker", and the "wither-tip" so far have been controlled effectively by spraying and pruning both at Kabete and at Thika, but their causal organisms are by no means well defined. Neither in America, South Africa nor in Australia are plant pathologists agreed as to the actual fungous parasites which are said to bring about these particular diseases; in fact in recent American literature it has been stated that a bacterium and not a fungus is the cause of the "canker" disease.

Two other diseases of citrus fruits, namely, the blackening of young oranges, and the premature falling of the same; also an unknown leaf-spot disease which appears to be peculiar to this country, have never been investigated in the laboratory.

If the organisms causing these diseases could be discovered and their life histories determined, particularly the manner of infection, we should be in a position to attack these pests at the weakest points of their life-cycles and to employ means to prevent effectively reinfection.

Spraying for fungous diseases is at present carried out in an unintelligent manner and the hope is always entertained that the application of some fungicide will kill the parasite and prevent its reoccurrence. As a matter of fact no fungous parasite has been yet completely eradicated although spraying has been carried out for some time. This is probably because an unknown stage of the parasite exists either as perennial mycelium within the tissues

tissues of the diseased trees,(which could be pruned out if proved to exist), or as fructifications which have fallen from the branches or leaves, as the case may be and lie hidden in the ground. It is from these sources that reinfection is brought about. 105

A more complete knowledge of the life-histories of such parasites would indicate methods of prevention whereas at present only a cure is aimed at.

These remarks apply particularly to citrus diseases.

The "scab", "canker", and "wither-tip" diseases, and an unknown leaf spot are under observation in my room at the present moment, as a result of a request for an account of the fungous diseases of citrus trees for a forthcoming departmental bulletin. Up to the present I have been given no opportunity of studying these diseases in the laboratory, and without such knowledge no accurate and complete account such as is desired is possible.

Three diseases due to bacteria have come under my observation, namely, the bud-rot of coconuts, a bacterial blotch of sisal, and quite recently a bacterial rot of maize. These require special facilities for dealing with, only a part of which are at present at my disposal.

The above is a brief statement of the more complicated problems in plant pathology with which I have had to deal during the four years I have been in the service of the Protectorate, without an assistant and with no proper laboratory facilities. I have made no mention of the great majority of other fungous parasites whose life-histories are well known and which have been satisfactorily controlled.

Before however, proceeding to details of requirements necessary to carry on present investigations I may be permitted to state briefly the position which I consider

Mycology

Mycology will assume in, say, ten years time, and to outline a scheme for the successful investigation and control of plant disease, which could be developed as means were forthcoming.

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Arrangements are now being made to deal with a large influx of Europeans mostly of the small holder class which will result in a greatly increased area under cultivation and consequently a large extension of fungous pests. For not only will the present known and recorded diseases tend to spread with the increase of their host plants; but also new ones will be introduced, and hitherto unknown parasites of native plants will most certainly extend their activities to economic varieties.

There is in fact, every reason to anticipate a great extension of the work at present carried on by the Mycologist; so much so that a control station similar to the excellent institutions of the United States will be an absolute necessity. Just as the present Veterinary and Bacteriological laboratories investigate human and animal diseases not only for this Protectorate but also for Uganda and adjoining territory; so likewise a station for the investigation, in the laboratory, of plant diseases should be erected for the whole of Eastern Africa.

The control station should consist of the following:-

(1) A fair acreage of ground in which would be grown a large number of young specimens of different economic plants e.g. the varieties of citrus, coffee cotton, peach, apple, guava etc. These would provide suitable material for spraying, isolation, and infection experiments.

(2) A general laboratory to deal with routine work and to receive all specimens sent in or collected for investigation.

(3) A research laboratory in which the more complicated and

and hitherto unknown diseases would be investigated.

(4) A room for sterilisation and media-making.

(5) A store for apparatus and reagents.

(6) An office and library.

(7) A museum in which would be set up nicely mounted specimens of diseased tissues and their accompanying parasites, and also an herbarium containing an ever increasing collection of indigenous and native plants.

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The last is quite as necessary as any of the others for it is most important to know the distribution of any particular ~~disease~~ parasite on native host plants.

The institution would be in the immediate charge of a plant pathologist who would direct the work of the station and also carry out research work on the more complicated and hitherto little-known diseases.

The Plant Pathologist would be assisted by the following staff:- a senior assistant Mycologist, part of whose duties would be to keep careful records of all investigation work; two junior assistants to carry on the routine work of the general laboratory, to make up media and sterilise apparatus as the occasion demanded, and to devise and carry out spraying experiments. Some sort of clerical assistance would be also necessary.

Having indicated above a scheme for the future development of Mycology in East Africa I give below immediate requirements necessary to carry on work already commenced but held up through the lack of facilities.

For the continuation of the investigation of Hemileia vastatrix a paraffin bath is necessary, heated and regulated either by electricity or oil. The electrically controlled apparatus is by far the more efficient although I understand that similar apparatus had to be abandoned in Mr.Kirkham's

Mr.Kirkham's laboratory owing to the high cost of electrical power. Paraffin waxes of certain fixed melting points are also required, and a good electric lamp as a source of illumination for the microscope, as it is necessary to work with a constant artificial light for the highest powers of the microscope rather than with daylight which is variable.

For the investigation of fungous parasites other than the rusts, two incubators are urgently required, one to work at low temperatures 15° -20°c) and a second to work at higher temperatures (22° - 25°c); also a set of cupboards and shelves in which can be kept cultures of the various parasites, both fungi and bacteria, under investigation. The above apparatus could be procured for about £50-

A further requirement necessary to carry on the investigation of plant disease in an efficient manner is an experimental patch of good ground from one to two acres in extent in which could be grown young plants of economic importance i.e. the varieties of citrus, coffee, peach, apple, etc. These are necessary for infection and control work a most important branch of the subject, particularly when two or more fungi are found occurring together in diseased tissues. Many fungi grow saprophytically on diseased and dead tissue following in the wake of the true causative organism. As an instance of this may be mentioned the coffee stem disease now under investigation, in which a species of Phoma has been found together with a species of Fusarium.

It is only by the isolation of all the organisms present in the lesions of a disease, and inoculating trial plants with each separately, that one can find out which particular organism is the cause of the disease.

My present post in the Agricultural Department is

is quite inadequate for the purpose of thoroughly investigating the fungous diseases of plants and will not hold any of the additional apparatus detailed above. Owing to its small size, the cultures of fungi and bacteria which I now have are continually becoming contaminated with extraneous organisms (moulds and air-bacteria), which doubles the work and necessitates much reculturing and therefore, the preparation of media more often than would be required under better laboratory conditions. The study, in pure cultures, of parasitic fungi is a lengthy proceeding in any case and the extra time entailed in duplicating this work is a serious consideration.

For these reasons I respectfully request that an extra stone building may be erected to consist of the following rooms, (1) a large room for a laboratory, (2) a smaller room for an office, museum, and library, (3) a small room for media making and, (4) a small room for a store. The building should not cost more than £600, and the building should be so designed that extensions can be added in the future to meet the inevitable increase of work. At present about one third of my equipment is still unpacked and is lying in the passage of the department owing to the already overcrowded condition of the one room at my disposal.

As there is no site with suitable ground for the growing of young experimental trees in the vicinity of the Agricultural Department, I would suggest that use be made of either, (1) the Botanic Gardens which are sufficiently centrally placed to suit all purposes, or, (2) Kabete Experimental Farm where the Entomological laboratory has been placed. As regards the former site the bungalow and surrounding grounds at present occupied by the Government dentist could be fenced off in accordance with the plan issued a short time ago by the P.W.D., and a second entrance opened in the Agura Road where

where a drive has been already cut through the grounds. 110

The new building could be erected in the remaining grounds (15 acres) which belong to the Department and there would be plenty of good ground available for the growing of young trees for experimental purposes such as I have detailed. As regards the site at the Experimental Farm which is situated some seven miles from Nairobi, it should be borne in mind that the proximity of the Entomological Laboratory would be a decided advantage; in so far as plant pathology comprises the investigation of both insect and fungous diseases of plants and cases often arise in which one expert wishes to consult the other.

Further, there is ample room at the Experimental Farm for the growing of economic trees for experimental purposes, and should it become necessary a laboratory for an Agricultural Chemist could be added. By the occupation of one set of buildings with ground for experimental purposes attached by the Mycologist, the Entomologist, and an Agricultural Chemist the cost of triplication of store rooms, apparatus, offices, libraries, journals and pamphlets would be avoided.

The building wherever erected should be fitted with electric light and provided with wall plugs for the use of the electrical apparatus; water should also be laid on to proper sinks to facilitate the cleaning of apparatus.

At present I do all cleaning and washing of apparatus myself as the glass ware is very delicate, costly, and not easily replaced. There is no water laid on to a proper sink in my present room and I have to make shift with a jug and basin which have to be constantly refilled. This also takes time and could be very well performed by an Indian boy such as Mr. Kirkham employs in his laboratory. This person could be further trained as a useful assistant in making up media, subculturing fungi and bacteria and

in looking after the laboratory work in my absence. 111

The lack of some sort of assistant is very much felt especially when much laboratory work has to be done, as at the present time, in consequence of which I am unable to leave head-quarters for any length of time. The carrying out of investigations in plant pathology in the laboratory, the work at Kabete in connection with wheat-breeding experiments, the supervision of labour at the Botanic Gardens and the visiting of plantations has become a large undertaking for one person single handed; and it is to be hoped that provision will be made in the near future for a European Assistant if the important problems of the fungous diseases of economic plants of this country are to be dealt with in an efficient manner.

To conclude, the facilities which are urgently required are as follows:-

(1) A ~~stone~~ building to consist of a laboratory, a store room, a sterilising room, and an office.

(2) The laboratory apparatus detailed above (incubators, paraffin bath etc.)

(3) Some sort of assistant.

I am,

Sir,

Your obedient servant,

W. J. Dowson.

Mycologist.

T.T. Ty 6 at.

Royal Botanic Gardens, Kew.

October 18, 1917.

COL... ...S

Sir,

I have the honour to acknowledge receipt of Colonial Office Letter No. 49902/1917, dated 16 October, 1917, transmitting copy of correspondence with the Officer Administering the Government of the East Africa Protectorate regarding the investigation of the causes of the coffee leaf disease in the Protectorate.

I am glad to learn from the letter of the Acting Governor that the buildings and apparatus immediately required can be furnished at so small a cost.

I am,

Sir,

Your obedient servant,

D Prain

Mr Bottomley
Pattach
30/10
bel 30/10/17 at once

52253A

Under Secretary of State,

Colonial Office,

Downing Street,

S. W. 1.

Gov. 49985/17 Gap

DRAFT.

The Director
Royal Botanic Gardens
Kew

18 October 1917

MINUTE.

Mr. Bearley 13 Oct
Mr. Battersby, 13.10.17 (20546)
Mr.
Mr. Grindle.
Mr. Lambert.
Mr. Read.
Sir G. Fiddes.
Sir A. Steel-Maitland.
Mr. Long.

With ref to the semi-official letter sent to you from this dept on the 2nd of May last, I am dd to trans to you, for your infor, a copy of corres with the Govr of the Gap regarding the investigation of the causes of the coffee leaf disease in the Prot.

341 - 2 May (20546)
491 - 22 Aug. P.D.