

# A SCHEME OF TREATMENT FOR THE CONTROL OF FOMES LIGNOSUS IN YOUNG RUBBER AREAS.

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*Fomes lignosus* causes root disease in rubber plantations of all ages, but the attack of the fungus is most virulent and causes most severe loss of stand between the second and the fifth year. It sometimes happens in a clearing, the age of which lies within these limits, that the depredations of the fungus rise to an alarming extent within a short space of time, and that the planter is faced with the problem of deciding what immediate steps he should take in order to prevent serious loss of stand.

In the following paragraphs a scheme of treatment is outlined for use in the control of attacks of all degrees of severity. The scheme has been drawn up after careful consideration of every phase of the problem in the light of certain experimental data which have recently come to hand, and has been in operation at the Institute's Experiment Station as a normal routine treatment for the past six months. It is early yet for a final statement to be made, but the experimental results which have so far been obtained justify the recommendation of the scheme for use on estates.

The first essential operation in dealing systematically with an attack of *Fomes lignosus* is a careful tree-to-tree inspection over the whole infected area. It is necessary that every tree should be thoroughly examined at the collar and for one to two feet along the laterals and six to eighteen inches down the tap root (depending on the size of the tree), and that, at the appearance of the slightest trace of the white strands characteristic of the fungus, the tree should be marked for treatment. It is advisable also to mark for treatment trees whose roots carry any other type of suspicious white markings, for there is evidence that the mycelium of the fungus can aggregate itself on the surface of roots in forms other than that of the typical "Fomes strands."

This tree-to-tree inspection is justified by the fact that, without it, it is impossible to make an accurate estimate of the distribution and extent of the disease, and hence impossible to draw up a control scheme commensurable with the requirements of the task to be performed.

Marked trees will fall into two main classes :—

- (a) Trees which *can* be detected without root examination.
- (b) Trees whose foliage still looks healthy, and which *cannot* be detected without a root examination.

Class (a) includes the trees which are already dead, and those whose leaves have acquired a sickly appearance.

Class (b) includes trees falling into two further subdivisions :—

- (b1) Trees whose foliage still looks healthy but whose root systems are more or less attacked by the fungus.
- (b2) Trees which bear external mycelium on their roots, but into whose tissues the fungus has not yet penetrated.

Trees in class (a) should be removed at once, and upon the thoroughness with which this operation is performed depends largely the ultimate success of the scheme. The roots of these trees should be followed up to their extremities and completely removed. Subsequent treatment of the sites will depend upon the planting and thinning out programmes.

If the hole is not to be replanted a trench should be put round it beyond the limits of the root range of the diseased tree, or beyond the source of infection, whichever is further from the hole. The trench should be two feet deep and a changkol wide and, if it is kept open, and if the roots of neighbouring trees are prevented from passing beyond it, it should be sufficient in itself to prevent spread of the disease from the infected site. Infection can remain dormant in the soil, however, for a considerable period of time, and there is always the risk in later years that the roots of surrounding trees will pass through or under the trench and will become infected, thus rendering the trench useless as a measure of control. It is safer to dig over the infected site to two feet, removing all buried timber and exposing the soil thoroughly to the sun, before the trench is made. All trenches dug to effect control of root diseases should be kept regularly cleaned out; if they are allowed to silt up, or if cover crop is allowed to grow across them, they become useless, and the labour spent on making them is wasted.

If the holes are to be replanted, the sites should always be dug over. It has been found that the following recommendations can be employed as a matter of routine in the treatment of the sites of dead trees up to 4 years of age :—

The tree should be removed completely, both the tap root and laterals being followed to their extremities and completely extracted, and the soil should be dug thoroughly to a depth of three feet within a circle of 8 feet in diameter about the site of the tree. Then a trench should be marked out 15 to 20 feet square (depending on the size of the tree) around the diseased area, and, between the trench and the deeply dug area, the soil should be dug to 18 inches and all timber removed. More deeply buried timber which is exposed during

this operation should be followed down and extracted. Finally the trench should be dug around the area to a depth of 2 feet, the soil being thrown towards the centre. This trench is intended to prevent infection from outside entering the treated area through the soil.

It seems probable that the most effective method of killing the mycelium of *Fomes lignosus* is to expose it to the action of light and desiccation. This can be effected by thorough cultivation, but it is impossible to expose every particle of soil to the action of the sun at one changkolling, and a succession of two or three cultivations at three-monthly intervals, although effective, means a considerable loss of time. It is recommended therefore that the central hole should be drenched with a fungicide when digging operations have been completed. It is most satisfactory to allow an interval of about a month to elapse between digging and drenching, so that any mycelium dormant in the soil may have an opportunity of renewing its activity and thus becoming more susceptible to injury by the fungicide, but this interval can be dispensed with and digging, drenching, and supplying, may follow on successive days. On the Experiment Station the fungicide at present in use is copper sulphate, which is applied at the rate of 5 gallons of a 2 per cent solution over the central deeply dug area.

The application of lime to the soil, with the object of reducing the activity of *Fomes lignosus*, may be regarded as a waste both of time and capital.

The treatment of trees falling in class (b) is of great importance in checking the spread of the fungus and in delimiting the areas of infection. It is rarely possible to detect signs of the disease in the roots by an observation of the aerial portions of a diseased tree until the tree is in an advanced stage of attack, and observations on the number of dead or sick trees in an area gives no indication of the distribution and extent of the disease. Treatment of individuals in this class, as in class (a), is influenced by the thinning-out programme, for if trees can be spared from the stand it will be as well to remove those of sub-class (bl) which are most heavily infected in the roots, treating them as belonging to class (a). It is doubtful whether any external treatment can be sufficiently penetrative to save a tree which is on the border line between classes (b) and (a).

Methods of treating trees in class (b) by the application of a fungicide as a liquid or a paint to the collar and the affected laterals, after the removal (and destruction) of as much as possible of the external mycelium, appear to be yielding satisfactory results. The treatment which is at present in use on 1—3 years old areas at the Experiment Station, is a drenching at the collar with 1 gallon of a 2 per cent solution of copper sulphate. The infected trees are treated as soon as possible after the root inspection and very little extra

digging is involved. The root systems are opened up until the whole extent of the mycelium on them is exposed, and the source of the mycelium is discovered if possible and removed. The solution is then poured into the earth cavity, and while it is still standing around the roots it is rubbed *gently* over the infected surfaces with the hand. In the treatment of older trees the volume of fungicide used per tree will have to be increased.

As an alternative method of treating class (b) cases, one estate reports favourable results with lime-sulphur solution. This has been applied at a strength of 1 per cent. (polysulphide sulphur) as a paint to infected roots. The lime-sulphur solution is made up as follows \* :—

“14 ozs. of quicklime are slaked and a little more water is added to make milk of lime. The mixture is strained and 35 ozs. of flowers of sulphur are stirred in and the mixture is diluted to one gallon by addition of water.

“The mixture is boiled for one hour and the upper clear liquid is decanted from the sludge. The liquid thus prepared contains about 10 per cent. of polysulphide sulphur.

“A 1 per cent. polysulphide mixture is obtained by diluting to 10 gallons with water.”

Lime sulphur is an unsuitable substance and it is not at present recommended for application to the soil in the treatment of trees falling in class (a).

It is not anticipated that one round of treatment on the lines of the above scheme will give effective control in a heavily diseased area. The treatment should be periodic. It has been observed that the mycelium of the fungus lives more or less epiphytically upon the bark for a certain length of time before penetration takes place. If therefore periodic rounds of treatment are put into operation at intervals which are less than the time it takes for the epiphytic mycelium to effect penetration, it should be possible to avoid the establishment of the disease in previously unaffected trees. From the results of experimental work already carried out, successive treatments at intervals of two or three months seem to be sufficiently effective for practical purposes even in heavily diseased areas. It may require two or three rounds of treatment at three-monthly intervals to gain control over a well-established attack, and two further treatments at six-monthly intervals may be necessary in extreme cases to keep the incidence low until the activity of the fungus naturally abates.

If the establishment of fresh cases can be prevented until this natural abatement takes place (usually in the fifth or sixth year),

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\* Beeley, F., Quarterly Journal of Rubber Research Institute, Vol 2, No 4, p. 216, April 1931.

and until the rubber trees are old enough to offer determined resistance to the disease, then successful control will have been obtained. It is hoped that such control will be effected by the above scheme. The scheme has not been in use for a sufficiently extended period to enable the Institute to recommend it with absolute confidence, but within the space of twelve months it is hoped that sufficient data will have accumulated to enable such a recommendation to be made. In the meanwhile intensive experimental work is being carried out, and the evidence of the results already available appears strong enough to justify the presentation of the foregoing scheme of control as a practical proposition.

A brief analysis of the costs of applying these control measures on the Experiment Station is given below. These include cost of labour and material but not of supervision and are given as costs per round of treatment, not as costs per annum. The soil is sandy and easily worked, and costs will be higher on heavier land.

*Tree-to-Tree Inspection (100 trees per acre).*

2 years' old rubber	...	15—20 cents per acre.
3 years' old rubber	...	30—50 cents per acre.

*Treatment of trees in class (a).*

In unstumped areas	...	70—110 cents per tree.
In stumped areas	...	60—90 cents per tree.

*Treatment of trees in class (b).*

2 years' old rubber	...	6—8 cents per tree.
3 years' old rubber	...	6—11 cents per tree.

The need for the immediate publication of a recommendation for the treatment of attacks of *Fomes lignosus* in young rubber areas has been shown by the number of inquiries recently received from estates asking for information on the subject. It is hoped that the foregoing paragraphs will answer the majority of questions which will arise in the immediate future in this connection, but the recommendation must be regarded as provisional only, pending the results of experiments already in hand.