STEM CANKERS IN CLONAL TEA IN THE LOW COUNTRY

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Many estates in the low country that have planted clonal tea, have been rewarded with immense success in terms of enormous yields, well in excess of 2,500 lb of made tea per acre per annum. Heavy doses of fertilizer have been applied to some of these clearings. On one estate situated in the Kalutara District, a 1958 clearing manured with about 500 lb nitrogen per acre per annum, gave around 5,000 lb made tea per acre, in the last year of its first pruning cycle.

The picture there is not, however, as rosy as it appears to be at first sight, because many plants of clones TRI 2023 and TRI 2026 were found to have severe cankers on the stems and branches. It is not known when the cankers began forming, because they remained hidden under the dense cover of tea, and were not noticed until they were exposed at pruning. The present article summarizes preliminary observations on the problem, but is primarily intended to acquaint superintendents with it, so that they could look out for signs of the trouble developing in their clearings.

Symptoms

At first, the only external symptom is an unevenness of the bark, indicating that it has been injured. The uneven areas often show a reddish-brown discoloration. Later, there is clear evidence of dead or dying bark, which eventually becomes dry and flaky, leaving drying wood underneath. After the bark dies, callusing begins along the edges of the dead areas, often resulting in large malformations. The affected bushes become weakened, they defoliate, and crop diminishes.

Fig. I shows cankers on a branch of clone TRI 2026 . These are characterized by an area of dead bark, a part of which has disappeared. Some wood as well, is dead. The callusing is erratic and has resulted in the abnormal growth. The cankers are more often than not confined to one side of a branch, but occasionally the branch may be completely ringed with a canker. Fig. 2 shows a case of severe damage to a bush of clone TRI 2023. A large amount of bark has been damaged, and even the wood has been destroyed by various wood rotting fungi and scavenging insects. Enormous cankers, some of them measuring over six inches in length, have formed. Rooting has taken place from the callus several inches above soil level. This degree of damage is presumably not very common. It is the most extreme case that has come to our notice so far. The earlier stages will probably be more frequently found.

None of the roots that were examined had any visible abnormality. No starch reserves were detected (by the iodine test) in these roots. This is probably not very significant because even healthy, vigorously growing plants often have no starch reserves in their roots. The damage to the bark however, could restrict the translocation of food material from the leaves to the roots. The root system would therefore be considerably weakened. Recovery of cankered bushes after pruning was extremely slow, in spite of the fact that generous lungs were retained. Some bushes died as a consequence of pruning.

Distribution and rate of spread

The cankers have so far been reported from only two estates, one in the Kalutara district, and the other in the Galle district. The superintendent of the Kalutara

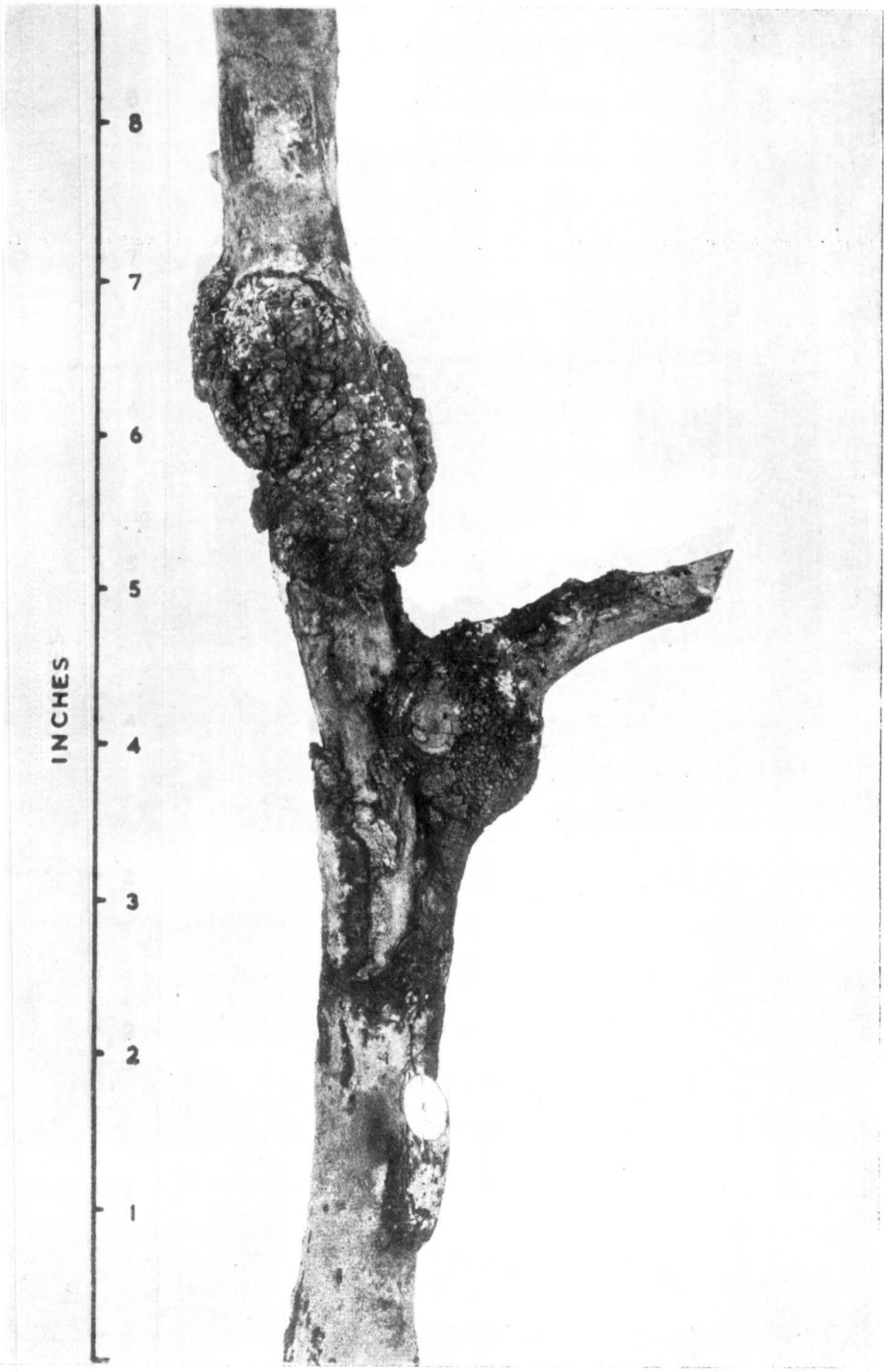

Figure 1.—A branch of Clone TRI 2026 showing a large canker surrounded by heavy erratic callus.

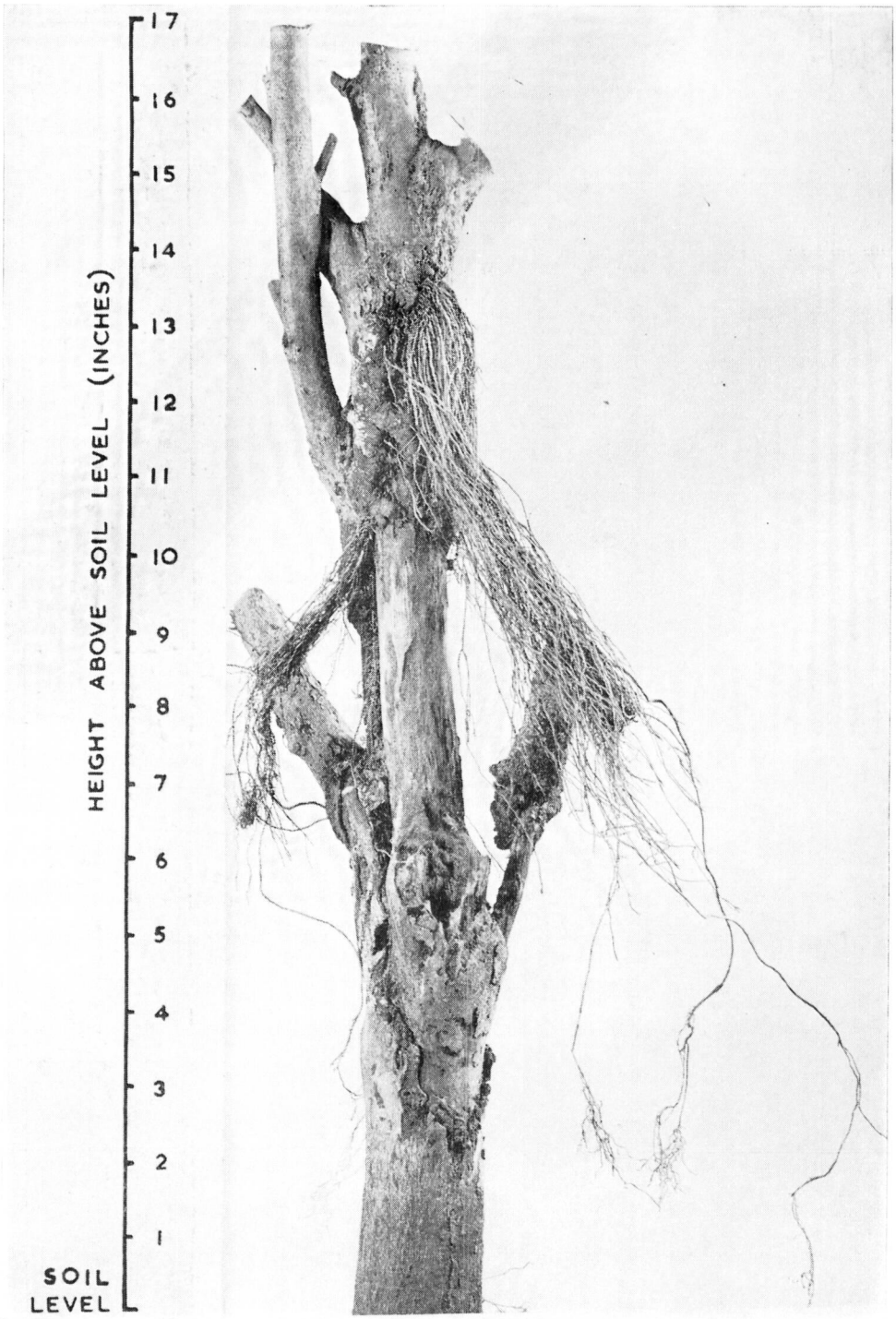

Figure 2.—The stem of a bush of clone TRI 2023 showing a large canker on some side branches as well as the main stem. The wood has been subsequently rotted, and roots arise from the heavy callus, about one foot above soil level.

estate has reported that in a 1958 clearing, 250 out of 3,432 (or over 7%) of the bushes of clone TRI 2023, and 192 out of 957 (or 20%) of the bushes of clone TRI, 2026 show cankers. Subsequent inspections have shown that the percentage of cankered bushes in the clearing is in fact much higher. Even so, figures of 7–20% are sufficiently high to warrant grave concern. The estate in the Galle district has cankered bushes of clone TRI 2024 in multiplication plots.

It is not possible to say anything at this stage, on the rate of spread of the damage. Neither is it possible to state with any degree of certainty whether clones are differentially susceptible to cankering.

It is possible that all cones could be affected to some extent. It is therefore suggested that all clones be very carefully examined.

Cause

The trouble probably arises from damage to the bark in the first instance. There could be much speculation on how this damage takes place, but no clear information is still available. Mulder, (1962), reported that the fungus *Leptothyrium theae* Petch can cause similar damage at elevations above 5,000 ft, but this fungus has not been isolated from any of the cankers from the low-country. The only fungus that was consistently isolated was *Botryodiplodia theobromae* Petch. Petch, (1923), first reported the presence of this fungus on the roots of dead tea bushes. Gadd, (1928), stated that *B. theobromae* could establish itself on dead roots, as well as on living roots of tea bushes whose vitality has been drastically reduced by some other factor.

Gadd, (1930), found some evidence that this fungus had limited parasitic tendencies, but he concluded that it could only attack weakened bushes, and not every bush indiscriminately. The fungus has so far not been associated with stem cankers in Ceylon tea.

The author takes the view that although *B. theobromae* has been isolated from the cankers, it seems unlikely that the fungus would actively parasitize healthy issues. Were it able to do this, then the damage on the two estates concerned, should be much more widespread than it is at present. This is a clear indication of its very limited ability to cause damage to tea unless some other setback has preceded the fungus attack.

Gadd, (1949), stated that the fungus *Macrophoma theicola* Petch can bring about cankering in tea at lower elevations, but this fungus has not been isolated from any cankered material now under consideration. It therefore remains for us to consider other possibilities which might lead up to the situation illustrated in Fig. 2.

Mechanical damage

Mechanical damage to the bark is one of the obvious possibilities which could spark off the trouble. Damage to the bark could very easily occur during cultural operations. Careless handling of tools during weeding could inflict some damage to the collar, while damage to the branches is conceivable during plucking. The bushes become so large, and the plant cover so thick, in the latter half of the pruning cycle, that it is only with some difficulty that the pluckers circulate through the tea. It is not possible to say more about mechanical damage until the results of some experiments are available. It would however be advisable to see that minimum damage, if at all, is caused to the bark, during cultural operations.

Effect of high manuring

One question that arises is, what connexion, if any, does the tremendous dose of fertilizer have to do with this problem? It is impossible to give a straight forward answer at his stage. Gadd, (1938), has related defoliation and die-back of shoots to manure being in direct contact with tea roots. The effects of high fertilizer application could have manifold effects on the plant.

Vegetative growth is encouraged, and succulence increases when the temperature is suitable, and moisture and nutrients are present in such proportions. One possibility is that with a high degree of succulence, the ease with which mechanical damage might occur, could increase, compared with that when the plants are more "hardened". We have no reason to suspect anything like "a nutritional imbalance".

One point arises in connexion with the frequency of manure application. Tolhurst, (1959), emphasizes that it is difficult to envisage a situation where any soil or a mature tea bush could store a year's supply of nutrients and release them steadily whatever the dose.

Accordingly, at least 2 applications are necessary, but more would seem to be desirable if practicable. In other words, the dose should be of greater benefit, the greater the number of applications. The estate in the Kalutara district applies manure at the rate of 1 oz per bush per month. This is very desirable, but because the plant cover is so luxuriant, and one can hardly see where one bush ends and the next begins, it is possible that some bushes got more than the intended dose. This in itself may not be critical. There is, however, one vitally important point which cannot be over-emphasized. The institute has repeatedly pin pointed (Tolhurst, 1959, 1961, 1963), the recommendation that under no circumstances should inorganic fertilizer come in direct contact with any portion of the plant. On this estate, the labourer apparently takes the requisite quantity of manure in a container, plunges it below the plucking table, and swishes it in the direction of what he thinks is the area between two bushes. If the manure falls on the stem which happens to be moist, damage would inevitably result.

Conditions favouring the spread of the damage

The trouble has only been reported in high rainfall areas. The estate in the Kalutara district receives an annual average of about 250 inches of rain, distributed evenly throughout the year. The longest drought period is no more than three weeks. Temperatures are high, making the conditions ideal for the growth of saprophytic or weakly parasitic fungi.

A word about shade seems appropriate. The shade (provided by *Gliricidia* trees) in the affected areas cannot be described as dense. If, however, we consider the microclimate of the stem and branches, the situation is very different. On heavily yielding tea, where the plant cover is so thick, there is very little light falling on the stems and branches. This would make conditions for the growth of saprophytic fungi still more favourable, because the shade would increase the humidity around the stems and branches.

Control measures

It is not possible to make outright recommendations on curative measures for this trouble as yet. The following suggestions are tentatively made:—

1. A careful examination of all clonal areas must be conducted, particularly in high rainfall areas where heavy and frequent manuring is in progress. Should signs of the trouble be observed, we urge you to contact the Institute immediately.

2. It is not possible to comment on differential clonal susceptibility yet. *All* clones must be examined, especially after pruning.

3. If a bush is found to be affected, it should be rested for a period of 8-10 weeks, to give it a chance to build up a better root system which would have been adversely affected as a result of the cankers interrupting the supply of food to the roots.

4. Because it would serve no purpose for branches which have died back to be kept on the bush, their removal is advisable.

5. Three rounds of a 50% copper fungicide at the rate of 1 oz. in 2 gallons of water should be applied once a fortnight to help check the growth of the saprophytic fungus population. The spray should be applied with a coarse nozzle on the affected stems and branches.

6. Care must be taken to avoid any mechanical damage to the stems and branches.

7. Good supervision of manuring operations is very necessary to ensure that the manure does not come in direct contact with the aerial parts of the plant, but falls on the soil instead.

Summary

Some high yielding clonal tea in the low country was found to have severe cankers on the stems and branches. The symptoms have been described and illustrated, in order to inform superintendents to look out for this trouble developing on their new clearings. The possible causes have been discussed.

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