

STEM BLEEDING OF COCONUTS

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1. Introduction

Stem Bleeding can result from a number of causes. These will be dealt with in the course of this resumé. Since bleeding caused as a result of infection by *Ceratostomella paradoxa* is of considerable importance, it will be dealt with first.

As a result of Dade's work published in the *Transactions of the British Mycological Society* (Vol. 13, pp. 184-194, 1925), it has been established that *Ceratostomella paradoxa* is the perfect stage of what was known as *Thielaviopsis paradoxa* (Des.) Von. H.

The fungus is widely distributed in the Tropics. It attacks sugar-cane, coconut palm, banana suckers and pineapples. It may gain entry through injuries made by boring insects.

The spores of *Ceratostomella* can also be disseminated by water, air currents or by an insect vector.

2. Symptoms of the Disease

The presence of the disease is indicated by the reddish brown or rust coloured liquid which oozes out of longitudinal cracks in the stem. The cracks vary, in length from half to three or more inches. One or more areas of infection may coalesce to produce a larger area. Old lesions cease to ooze and the dark brown fluid dries up and turns black. On cutting into the stem below the bleeding lesion, the tissue is found to be rotted away and yellow in colour. This tissue later turns black. Infection may occur anywhere, but in older palms it is usually on the lower parts of the trunk where cracks are abundantly developed and not in softer portions of the trunk. The extent of damage depends on the age of the palm and the conditions under which it is grown. In India, young palms have been killed by the disease but this is not common.

3. Distribution of the Disease

The universal distribution of the disease is an important consideration. Petch says that there is no district without its quota of affected trees whether it be near the sea or inland, at sea levels or at the upper limit of the coconut zone.

The soil along the coast is sandy but immediately behind this are rather extensive swamp areas and many of the inland villages are low-lying. The valley of the Maha Oya is regarded as excellent coconut land because of its deep alluvial loam, that is deposited as a result of flood but due to its dampness it favours the presence of the disease. Further inland towards Giri the land becomes stiff and rocky. Generally in this area the trees are more stunted and it is likely that disease makes less progress. Much of the coconut land in the Kelaniya Valley is cabook and this is responsible for stunted trees. It must be borne in mind that more rapidly the tree grows the softer is the stem and more liable to be seriously affected by the stem bleed disease.

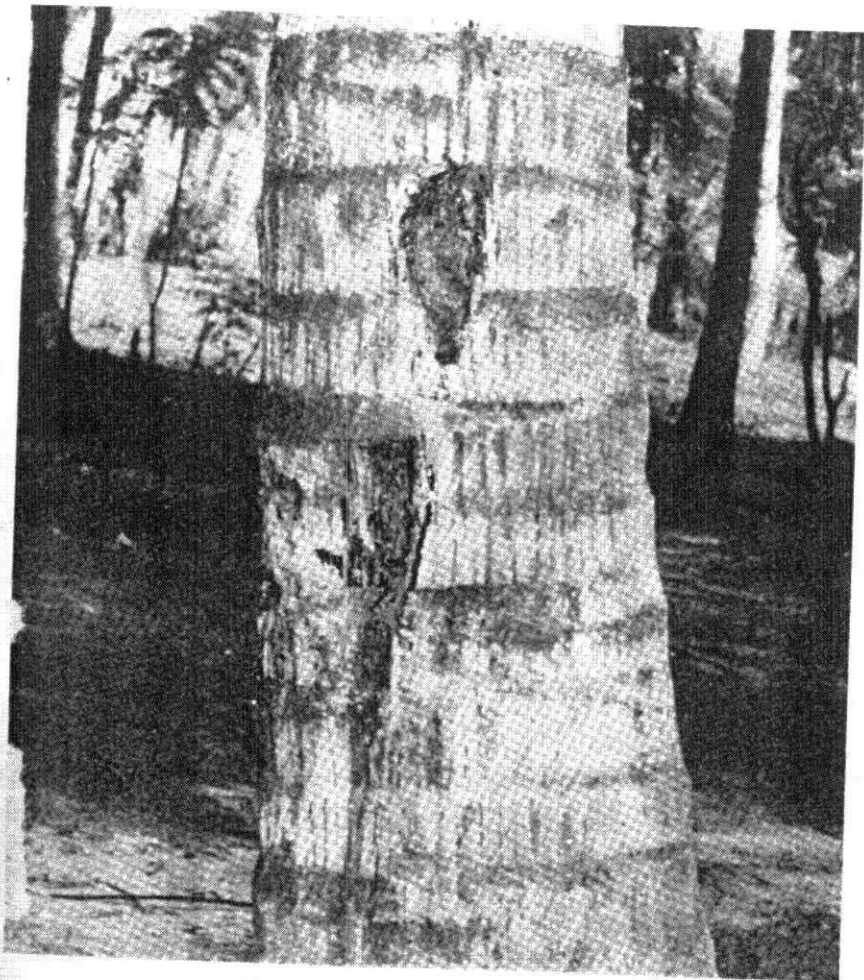
Contrary to theories, tapping for toddy does not prevent the onset of the stem bleeding disease. Petch observed this in the Kalutara district. In the Kurunegala district where the soil is more or less cabooky the disease occurs. This is also so in the sandy districts of Chilaw and Puttalam. The disease occurs also in the Kegalla district from Polgahawela to Yatiyantota. In the Tangalla district where the soil is very poor, ranging from gravel and reclaimed soil, it is found particularly in the swampy localities in which the trees are well grown. In closely planted areas in the Southern Province where the palms tend to grow thin, they may become easily susceptible.

In the Batticaloa districts where the soil for the most part is dry and sandy and contains a large amount of lime, the disease is less evident. This may be due to the drought conditions which may extend for seven months and the slow growth of the trees.

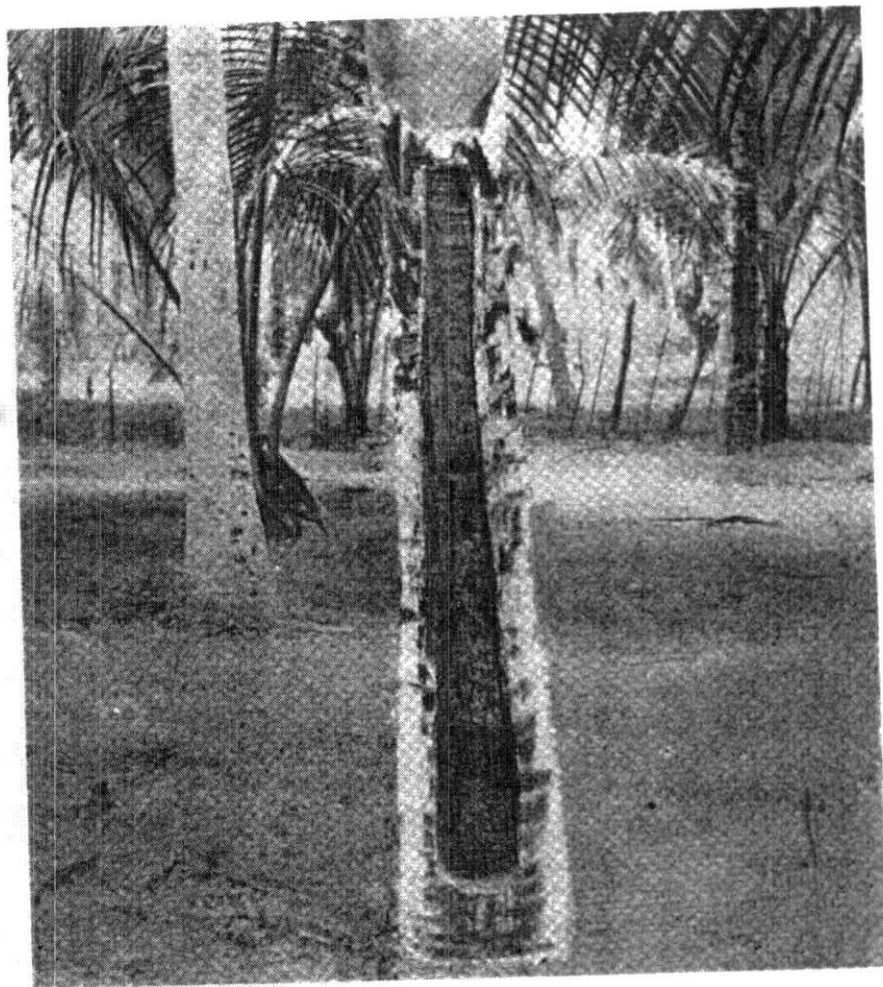
In the Trincomalee district no diseased trees were found by Petch.



A primary bleeding spot which shows the typical characteristics of 'Stem Bleeding'. Note the dark colour of the exudation.



Multiple lesions of 'Stem Bleeding' on an 8-year old palm.
These lesions may coalesce to give a large area of
diseased tissue.



Multiple lesions which have coalesced to give a large area of diseased tissue. The diseased tissue has been chiselled out to give an idea of the extent of damage to an 8-year old palm.



An advanced case of 'Stem Bleeding'. The picture shows the extent of effected tissue that has been chiselled out prior to painting the remaining healthy tissue with coal tar or Bordeaux paste.

4. Effect of the Disease

The cracking of the bark is a normal feature of the coconut stem. It occurs on all trees and it is not a sign of disease. The only indication of the disease is the flow of sap from the cracks in the 'bark' but even this is not infallible because the stem may bleed from other causes. If the liquid is viscid and makes a patch of perceptible thickness which soon turns black and if the bleeding spots occur singly, or in small numbers, then it may be typed as stem bleeding disease. Should the stem bleed from other causes, usually the liquid is more watery and makes a red-brown stain, and this occurs from numerous bleeding spots which are close together.

The effect of the disease varies with the age of the trees. Usually symptoms of the disease on trees over forty years are found in the lower half. The liquid forms a very small patch around the crack from which it issues. Since the disease is confined to small patches in such trees, it indicates the stoppage of the disease which is probably due to lack of food, in the tissues of the cortex. The wood in these old trees is not affected because the whole of the ground tissue has undergone secondary thickening. Consequently, it might be said that the disease can do no more harm than destroying the bark of the older trees if they are attacked in the lower regions. When however, an old tree is attacked near the crown, the symptoms may resemble those on younger trees. The ground tissue of younger trees is soft and contains sugars, etc. which meet the nutritive requirements of the fungus. The disease symptoms are the same as on older trees. During dry weather although bleeding stops as a result of the tree requiring moisture, the fungus is not killed. In wet weather the bleeding begins again and the size of the patches increases. The size of the patch to some extent indicates the amount of decay that has occurred. The cortex beneath these patches decay and further decay has taken place in the central column. This then is the difference between decay in older trees and younger trees.

In the central column the decay progresses more rapidly upwards than downwards. Fungus destroys the ground tissue only leaving the bundles to decay afterwards. The decayed tissue runs in bands which are well defined both by their colour and consistency from the still sound white tissue. There is never a general decay of the whole stem at the same time such as may occur in cases of root decay.

On trees up to twelve years of age the diagnosis of the disease and the detection of the extent of the decay is of very great importance because the external patch in such cases is usually small and gives no indication of the extent of the internal decay. The extent of the decay may be so great as to result in the formation of hollow stems. The liquid which oozes from the bases of young trees may be almost colourless while that which exudes from the older trees is usually brown at first.

The spores of the fungus have been found in the liquid squeezed from the internal advanced edge of the decayed tissue as well as in that which exudes.

It must be remembered that there is no definite position of the 'bleeding' spot on the stem nor are any trees of any age immune. In general, on younger trees the spots may occur on any part of the trees but on older trees the spots are localised to the upper half of the tree. As a result the disease does more damage on a well grown tree than on a stunted tree. This is probably due to the fact that vascular bundles are closer together in the poorer trees and these are generally harder because of the retarded growth of the tree and also because the cortex does not contract and split so much as on the thicker stems.

5. The Size of the Coconut Tree in Relation to the Disease

Trees with a bulbous base are often attacked but those with a narrow thin trunk without a bulbous swelling at the base, do not seem to be affected. The cracks caused on well grown bulbous trees are due to contraction of the cortex. We can therefore consider that a swollen base is a source of weakness in the case of the disease. It is likely that the depth of planting is related to the production of a bulbous base. Generally with deep planting a bulbous base is not produced.

6. Influence on the Crop

Petch says that he has only one record of a diminution of crop that could be attributed to the stem bleeding disease. In this case there was a decrease of a thousand nuts. Since the weather is one of the controlling factors in the fluctuations of the crop any effect due to the disease is probably masked by this factor. In cases where the trees have been severely attacked, and consequently large sections of the stem have been removed, resulting in the diminution of the water conducting tissue, then an effect similar to that caused by drought may be manifested, but this is not likely to happen as the tree can obtain sufficient quantities of water to meet its needs. Light infections of the disease should cause no concern about falling yields.

7. Requirements of the Organism

Ceratostomella grows luxuriantly on the inner tissues of the coconut stem. It will only grow on the inner tissues of the fresh leaves and husks, and not at all on the inner tissues of fallen leaves, and brown husks.

8. Other Causes of the Bleeding

Bleeding can occur as a result of lightning, fire as well.

These are due purely to mechanical injuries.

Bleeding may occur when red-weevil grubs attack the trunk.

Bleeding may be due to physiological conditions.

The physiological causes are as follows :—

- (a) *Stem Bleeding following manuring.*—It has been reported from one estate that bleeding from the stem occurred after manuring. In some of the manurial plots in a manurial experiment conducted by the Soil Chemist, there had been bleeding in the plots which received the higher dose of manure of a mixture of Sulphate of Ammonia, Saphos Phosphate and Muriate of Potash. The soil type on this estate was a well drained loam which overlay a heavier sub-soil.
- (b) *Following heavy rains after prolonged drought.*—It is common knowledge that when drought prevails the palms suffer from lack of moisture. Later when rains fall and soil becomes moist, the palms will start absorbing large quantities of water and sap; so much that the stem may become unable to contain the large stream of liquid. Consequently, the sap is thrown off through the bark. This becomes a form of stem bleeding.

- (c) *Following floods.*—Estates situated on the banks of a river may get inundated with flood water. The palms take a considerable amount of water from the wet soil, and the palms may bleed due to conditions similar to those when heavy rains follow drought.
- (d) In lands with fluctuating water tables, especially in Northern Province, palms are known to be affected by bleeding.

9. Resistance to the Disease

All varieties of the coconut appear equally liable to attacks of *Ceratostomella*, though the King Coconut may suffer more than the others (Petch).

Stem bleeding 'resistance' has been due purely to anatomical differences depending on the age of the palm. Therefore, it is unlikely that strains of coconut will be found resistant to the stem bleeding as a result of attack by *Ceratostomella*.

10. Control Measures

The disease can be controlled by carrying out the following treatment. The infected tissue should be cut out with a chisel. The inner tissue should be scooped out till no diseased tissue is left. The cut surface is then painted over with coal tar or Bordeaux paste.

The damage caused by the disease can be prevented if the palms are not subjected to any drastic changes in the soil moisture, which means that the normal soil moisture conservation practices should be employed together with maintenance of soil fertility and these would result in optimum conditions for rapid growth. This is a control measure that could be practised with advantage by growers. It is one with a purely cultural basis.

'I CERTAINLY DO NOT BELIEVE THAT ANY RESEARCH WORK OF PERMANENT VALUE IS DONE, OR ANY DISCOVERY OF IMPORTANCE SOUNDLY ESTABLISHED, WITHOUT A GREAT DEAL OF HARD, SYSTEMATIC AND CONSCIENTIOUS WORK'.

SIR HENRY DALE.

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