CHAPTER VII

DISEASES AFFECTING COCONUT
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ROOT-WILT DISEASE

This disease was first noticed in three isolated pockets, one at Erattupettah in Kottayam district and two at Kathipara and Kayankulam in Alleppey district within 50 Kilometre of each other, following the floods of 1882. Since then it has been slowly spreading to North and South Kerala and even to Tamil Nadu.

The disease has been noticed in all types of soils under varying ecological conditions from foot hills to coastal sands. Although the disease occurs in palms of all ages, young palms in pre and early bearing stages are more susceptible.

The disease is debilitating in nature but not leathel. Loss in terms of nut-yield is proportional to the intensity of the disease and varies from 10 to 80 per cent.

Symptoms of Root-wilt Disease

The characteristic symptoms of the disease are general wilting of the leaves and yellowing of leaflets.
The abnormal bending or ribbing of leaflets termed as flacidity is a typical feature of the disease. There is abnormal shedding of female flowers and buttons. As the disease advances, the whole crown gets smaller in size due to reduction in size and number of leaves. There is also a reduction in the number of roots produced and a high percentage of roots is seen to rot.

Impact of Root-wilt Disease

According to a study by the CPCRI, the disease which was first reported in 1882 in the erstwhile state of Travancore has now spread to eight districts of Kerala, namely, Trivandrum, Quilon, Pathanamthitta, Alleppey, Kottayam, Idukki, Ernakulam and Trichur. Isolated incidence has been reported from other districts.

The effects of the disease on nut quality characteristics, oil content and free fatty acid content have been scientifically studied. Table 7.1 provides data on this aspect.

### TABLE 7.2

**Root (wilt) Disease Incidence in WCT and D x T Hybrid Palms at CPCRI Regional Station, Kayamkulam**

<table>
<thead>
<tr>
<th>Year from planting</th>
<th>Disease incidence (per cent)</th>
<th>Year from planting</th>
<th>Disease incidence (Per cent)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>2.2</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>6</td>
<td>4.3</td>
<td>6</td>
<td>3.6</td>
</tr>
<tr>
<td>7</td>
<td>8.8</td>
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</tr>
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<td>8</td>
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<td>8</td>
<td>6.5</td>
</tr>
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<td>29.3</td>
<td>9</td>
<td>19.6</td>
</tr>
<tr>
<td>10</td>
<td>35.5</td>
<td>10</td>
<td>20.2</td>
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</table>

Thirty per cent of the area under crop in Kerala comprising 15 million palms has been affected by root-wilt. The annual loss in production is significant, as given earlier, according to the CPCRI study. It is estimated that the loss which Kerala economy incurs every year due to the disease is about Rs. 300 crores.

Kerala State which has so far been the first in India in the matter of coconut production is likely to be relegated to the second position as Tamil Nadu is constantly increasing area and output of coconut. This possibility is not likely to be avoided unless urgent steps are taken to solve the root-wilt and other diseases affecting coconut in Kerala. The area under coconut in Tamil Nadu is only about 20 per cent of the total area of coconut in Kerala. But during the last decade coconut production in Tamil Nadu increased by 77 per cent, while that of Kerala decreased by 40 per cent.

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3. Ibid.


Research into Root-wilt

The Director of the Central Plantation Crops Research Institute (CPCRI), Kasargod, Dr. K.V.A. Bavappa told pressmen at New Delhi, 7 April 1985 that the Coconut Research Centre at Kayamkulam was very close to success in preventing the root-wilt disease affecting coconut. He attributed the reason for root-wilt to a particular type of pest; however, the experimental work in this regard has only reached an advance stage and a final verdict will have to wait.

"The cause of the malady reported nearly a century ago has now been elucidated to be Mycoplasma like organism (MLO), through its consistent presence in different tissues of the root (wilt) affected palms seen under the electron microscope and its conspicuous absence in the disease free palms." 

The Programme for Rehabilitation of Root-wilt Affected Palms

The programme for rehabilitation and rejuvenation of the disease affected coconut plantations started in 1977-78 is an ill-conceived plan. The programme which


7. Ibid.
plans to contain the disease between two belts, one in the north (Trichur district) and the other in the south (Trivandrum district) would not serve its purpose. The scheme plans to replant disease affected palms, but those palms which are replanted would also suffer from the disease. Moreover, those palms which are having the disease would also be yielding. Thus, by cutting-off all disease-affected palms, the farms concerned would be suffering losses. Apart from the fact that newly replanted palms would take a gestation period to start yielding, there is no guarantee that the newly yeilding palms would yield more than the palms which are cut. This is because newly planted palms are also likely to contract the disease and their yielding may be uneconomic. Further, there is no evidence that, by removing all palms affected by root-wilt, the disease in that area would come to an end.

Available data show that improving the soil physical condition and nutrient status, primarily through organic sources, can substantially help to increase the yield of root (wilt) affected palms. "When animal waste was recycled there was an overall increase in yield of diseased palms by 26.1 per cent (plot average). This also resulted in increased soil organic carbon content
and microbial activity". 

"No positive result has so far been obtained with the use of fungicides and bactericides in the control of the root-wilt disease. All attempts to isolate resistant varieties by progeny testing of healthy palms from diseased areas, and also using pollen from these for making crosses, have not so far yielded positive results". 

Despite various measures taken by government authorities, including those by agricultural extension officers, it is surprising that the coconut farmers generally are not aware of such measures. The data collected through our field survey are given in table 7.3.

As can be seen from the table, most of the respondents (61.48 per cent) do not know of any existing measures against root (wilt) disease. Further, a significant portion (37.7 per cent) of the respondents


TABLE 7.3

Awareness of Farmers About Existing
Anti-root (wilt) Measures

<table>
<thead>
<tr>
<th>Details</th>
<th>Response (Percentage)</th>
</tr>
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<tbody>
<tr>
<td>Nothing</td>
<td>37.70</td>
</tr>
<tr>
<td>Don't know</td>
<td>61.48</td>
</tr>
<tr>
<td>No response</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Source: Primary data collected through field surveys.

opined that there are no anti-root (wilt) measures at all. This is a sad commentary on whatever measures the government have been implementing so far, successful or not, in eradicating the disease or otherwise.

PESTS AND DISEASES

There are a number of pests and diseases affecting coconut palms. Their nature, the type of damage caused and remedial measures are described in the following paragraphs.
1) **Rhinoceros Beetle**

This is the most serious pest of the coconut palm and is found in all the coconut growing countries. The coconut palm has been found to be the most favoured of all the palms by this beetle. The damage is caused by the adult beetle, which is active in the night.¹¹

**Nature of damage:** The adult beetle bores into the soft tissue of the bud by cutting and chewing the tender unopened leaves and inflorescences. Though the adult palms do not die from this beetle's attack, it may cause the death of young palms by boring into the growing point and destroying it. In India, on an average, the beetle destroys one inflorescence per palm, thus reducing the yield by ten per cent every year.¹²

**Control measures**

As the breeding takes place in manure pits and other decaying organic refuses, the beetle can be effectively controlled by destroying it at the earlier stages of development such as eggs, grubs and pupae.

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¹² Ibid.
PESTS AFFECTING COCONUT PALM

1. RED PALM WEEVIL

2. RHINOCEROUS BEETLE
This can be done by spraying the manure pits every alternate month with a 0.1 per cent solution of BHC. Equally important is the maintenance of the garden in a clean condition. The organic refuses and coconut logs and stumps should be properly disposed off. Mechanical extraction of the beetle from the crown of the palms with a beetle hook is also effective.

2) **Red Palm Weevil**

The Red Palm Weevil is a dangerous pest of the coconut palm. The damage is done by the grubs which spend all their time inside the palm, feeding on the soft tissue. For laying of eggs the female beetle is attracted to those palms which are injured either by the Rhinoceros beetle or by other means. The beetle scoops out small cavities on the injured portions and lays its eggs. The grubs, on hatching bore into the soft tissue of the stem or crown for feeding and ultimately cause the death of the affected palm.

The first indication of the presence of the past is holes on the stem with chewed fibrous material sometimes protruding out. Usually a reddish brown liquid is found oozing out of these holes. At this stage, if the grubs are promptly destroyed, the affected palm can be saved.
Control measures

As the female weevil lays eggs in the wounds caused by the Rhinocerous beetle, control measures against the Rhinocerous beetle may help to minimise the attack of the Red Palm Weevil.

Secondly, injection of the chemical, Pyrocone E 2/20, at one per cent concentration into the infected trees at the rate of 1000-1500 C.C. per tree has been found to be effective.13

3) Coreid Bug

As a result of the attack by this pest, the attacked buttons do not develop and tender nuts become barren.14

Control measures: The control measure for this pest is to apply BHC/Sevin 0.2 per cent or Endosulfan (Thiodan) 0.05 per cent on the newly opened inflorescence after the receptive phase of female flowers.15

13. Farm Guide 1983, Farm Information Bureau, Government of Kerala,

14. Ibid.

15. Ibid.
3. BLACK HEADED CATERPILLAR

a) MOTH OF THE CATERPILLAR

b) CATERPILLAR
4) **Black Headed Caterpillar**

The Black Headed Caterpillar or the leaf eating caterpillar is the larva of a medium sized moth which is common in the coastal and backwater areas of the country. The larvae live on the green matter of the leaves and cause a reduction in the functional leaf surface, leading to reduced yield.16

**Control measures:** The suggested control measure is spraying of the affected palms once in two months with a 0.2 per cent DDT solution.17 Biological control has also been found to be effective.18

5) **Cockchafer**

The larvae of the cockchafer beetle, popularly known as 'white grubs', cause damage to the coconut palms by feeding on the roots. It lives inside the soil and are usually found in sandy or sandy loam soils of certain localities of Kerala.

**Control measures:** Firstly, tillage in the months of May and September when the larvae emerge in large numbers from the sub-soil to the surface will expose

the pest to the attack of natural predators like birds, cats, dogs etc. Secondly, application of about 63 kilograms of 5 per cent BHC or 30 kilograms of 5 per cent chlordane per hectare at the time of tillage will effectively control the pest.19

Rats

The rat is a serious pest of the coconut palm in certain localities. The extent of damage caused by rats is estimated to be 5 to 10 per cent of the total production every year.20 The rats enter palms and dig into the immature nuts to eat the meat. The attacked nuts are damaged and eventually they fall down. The damage is severe in coconut gardens where the palms are closely planted where the rats can jump from one palm to another and remain on the crown of the palm for many days.

Control measures: Use of traditional traps is the most popular measure against rats. A variety of traps are used for the purpose in different parts of the country. Most of the control measures, however, are not effective because the rats are intelligent enough to avoid the traps

19. Ibid.
20. Ibid.
and baits. Recently the use of warfarin block has been recommended to control the rats. The advantage of warfarin blocks over other chemicals is that it affects the rat a few days after its consumption and the death will be suspected to be natural. Warfarin block is also not affected by rain and does not need replacement until completely eaten away.

**DISEASES**

Apart from pests, the coconut palms are badly affected by a number of diseases.

1) **Stem bleeding**

Stem bleeding was first reported in India in 1922. It occurs in coconut palms in all types of soils. The extent of damage varies from reduction in yield to complete death of the palms.\(^{21}\) Palms affected with stem bleeding are found exuding a reddish brown liquid through cracks on the lower part of the husk.\(^{22}\) The disease is believed to be caused by infection by ceratostomella paradox through the growth cracks on the stem.\(^{23}\)

\(^{21}\) Coconut disease of uncertain Etiology, Central Plantation Crops Research Institute, Kasargod.

\(^{22}\) Ibid.

\(^{23}\) Ibid.
Control measures: A number of control measures have been suggested, the most important of which are the following:

i) Organic manuring: In experiments in certain gardens it was found that by stopping NPK fertilisers and applying organic or fish manure, stem bleeding could be stopped.24

ii) Coal tar treatment: The bleeding area is covered with molten coal tar or Bordeaux paste.

iii) Improving drainage in lowlying waterlogged areas, and soil moisture conservation measures in drought areas has proved beneficial.25

2) Bud Rot

The symptom of this disease is that the central leaves wither with yellowish discolouration and get easily detached. The rotting spreads to the soft tissue of the bud and it gets destroyed.26

24. Ibid.
25. Ibid.
PLATE 7.4

PUMPING MEDICINE IN COCONUT GARDEN
WITH SIMPLE HAND PUMP
Control measures: "In the early stages of the disease remove affected tissues and treat the crown with Bordeaux paste. A protective covering should be given till normal shoots emerge. Burn all disease affected tissues removed from the palm. Spray 1 per cent Bordeaux mixture on treated and neighbouring plants as a preventative measure".27

3) Mahali and Grey Blight

Shedding of female flowers and immature nuts are the symptoms of the disease. Lesion appears on the young fruits or buttons near the stalk which later develop to decay of the underlying tissues.

Control measures: The suggested control measure is to spray 1 per cent Bordeaux mixture on the crown before monsoon and once or twice at intervals of 40 days or spray copper fungicides.28

4) Grey Blight

It appears in the mature leaves of the outer whorl as yellow specks encircled by a greyish band which

27. Ibid.

28. Ibid,
later becomes white. The spots later coalesce into irregular necrotic patches.\textsuperscript{29}

**Defects of Measures for Controlling Pests and Diseases**

A review of available literature shows that considerable work has been done by scientists in the field of not only analysis of the causes of diseases and pests affecting coconut, but also remedial measures. Unfortunately, most of the findings still remain within the four walls of research institutions and experimental stations and adequate efforts have not been made so far to disseminate such scientific knowledge to the large population of coconut farmers in Kerala; particularly small and medium farmers. Extension work undertaken by agricultural scientists remain ornamental and cannot, by any means, be considered adequate enough even to cope with the fringe of the problem.

Coconut, being the most important crop having a significant weight in the economy of Kerala in general, and the agrarian sector in particular, it is high time that policy makers, planners, agricultural scientists and administrators give a fresh look at the policies

\textsuperscript{29} Ibid.
and strategies of developments pursued so far. Even with the existing scientific and technological knowledge about various aspects of coconut cultivation, substantial progress can be made, provided effective delivery mechanisms are evolved for the dissemination of knowledge and the transfer of appropriate technology supported by supply of adequate inputs, infrastructural arrangements and follow-up action to support the coconut cultivators on a continuous and sustained basis.
TECHNICAL ANNEXURE

NUTRITIONAL STATUS OF ROOT-MILT-AFFECTED PALMS AND SOILS
TECHNICAL ANNEXURE

NUTRIENT STATUS STUDIES OF ROOT-WILT AFFECTED PALMS AND SOILS

Major nutrients (N, P and K)

It is seen that total nitrogen content of healthy soils is lower than that of disease affected area with the exception of coastal sand and sandy loam. Available P did not differ while exchangeable K was lower in diseased trait in sandy loam and reclaimed soil but only in the former there was a statistical significance.

In the case of leaf levels of these nutrients healthy palms had lower levels compared to unhealthy palms and in most cases the differences were statistically significant. The tendency of these nutrients is to accumulate in diseased palms.

Secondary elements (Ca, Mg and S)

There was no difference in exchangeable Ca and Mg of soil between healthy and diseased zones. On the contrary, sulphur status was generally lower in diseased trait and significantly so in alluvial and
sandy loam. Leaf levels of these elements more or less followed the same pattern.

**Trace elements** (Fe, Mn, ZA, Cu, B, Mo and AL)

Fe was significantly higher in laterite and coastal sandy soils. In healthy laterite, coastal sandy and sandy loam soils easily reducible and active Mn trends were significantly higher, while exchangeable Mn was higher in sandy loam. Zinc was found in significantly higher concentrations in healthy zone in alluvial, reclaimed and coastal sandy soils. The trend, though similar in other soils also, was not significant. Molybdenum status of alluvial soil in healthy zone was significantly low as compared to the diseased zone.

Foliar analysis of levels of micronutrients showed that zinc was invariably lower in diseased palms, manganese was significantly higher in healthy palms growing on coastal sand and sandy loam. Though a similar trend was observed in other soils also, the difference between healthy and diseased palms was not significant. Iron content of healthy palms on alluvial and laterite was significantly higher than that of diseased palms on the same soils. In healthy palms on
coastal sand the molybdenum content was significantly higher than that in the diseased palms. Baron content of healthy palms was higher in alluvial soil.

In case of AL the healthy palms were found to contain significantly higher amounts in all soils as compared to diseased palms.

Observations rule out the possibility of the association of major nutrient deficiencies with the disease.

As regards Ca and Mg no regular pattern is apparent. The results do not agree with observations that low levels of Ca and Mg in palm may be the major factor responsible for the disease incidence. However, imbalances in the cationic ratios in diseased palms are evident. The ratios K/Na, K/Mg, K/Ca+Mg and K/(Na+Ca+Mg) are considerably lower in healthy palms, indicating the predominance of K in diseased palms. When the total content of monovalents (K+Na) and that of divalents (Ca+Mg) were compared the values showed a steady increase in the total monovalents with increasing disease intensity and divalents just the reverse trend.
Among secondary nutrients S seems to be of importance. Though the available S content in healthy palms is significantly higher only in alluvial soil, in other soils a similar trend is evident. Sulphur contents of leaf also follow the same pattern with very few exceptions. As sulphur is a constituent of certain amino acids which go into the creation of protein, the protein metabolism may be adversely affected. S deficiency is also shown by N/S and P/S ratios. Both these ratios are higher in diseased palms showing the inadequacy of S.

Among the micronutrients, Cu and B do not seem to have a role in the incidence of disease. Main emphasis may be placed on Zn, Mn, Fe and Mo in this group of nutrients. Differences in Zn content of both leaf and soil between healthy and diseased trait is the most contrasting of all. The diseased palm, in general, showed a very low concentration of less than 10 ppm while healthy palms showed a mean value well above 15 ppm. Zn/P ratio is also more than double as compared to that of diseased palms. Leaf values of Mn were considerably lower in the diseased palms and in coastal sand the diseased palm gave extremely lower values (less than 10 ppm) as against a mean value of 83.6 ppm in healthy palms. Mn/P ratio is also considerably higher in healthy palms.
Molybdenum and Fe content of soils did not show much relation to the disease though the latter is higher in healthy zone than in laterite soil. Leaf content of these two nutrients, however, were lower in diseased palms. A higher ratio of P/Fe in diseased palms was also observed.

It is also interesting to observe that except Cu and B, the content of all other trace elements including Al in the diseased palms are lower than in healthy palms.