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Root (Wilt) Disease  
-A Practical  
Approach-  
“Contain the  
Disease and Live  
with it”



CENTRAL PLANTATION CROPS RESEARCH INSTITUTE  
KASARAGOD-670124 KERALA, INDIA

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# COCONUT ROOT (WILT) DISEASE – A PRACTICAL APPROACH – "CONTAIN THE DISEASE AND LIVE WITH IT"

## INTRODUCTION

The century-old root (wilt) disease of coconut in Kerala is spreading slowly and steadily in all directions. The disease originally reported in 1882 at Erattupetta has now established almost contiguously in seven districts viz. Trivandrum, Alleppey, Quilon, Kottayam, Idikki, Ernakulam and Trichur. The incidence of the disease in more than 30 per cent of the 7,50,000 ha under coconut in Kerala is causing an estimated annual loss of about 340 million nuts. It has also made its appearance in some groves in the neighbouring state of Tamil Nadu.

Even though research on coconut root (wilt) disease was initiated in 1948, co-ordinated research programmes were drawn out and implemented only from 1970 with the establishment of the CPCRI when scientific efforts acquired better direction and new dimensions. Over the years, considerable information has been gathered on the various aspects of the malady. The disease is characterised by an abnormal bending or ribbing of the leaflets. A general yellowing of the older leaves and drying of the margins of leaflets are also noticed. Shedding of buttons and immature nuts and reduction in number and size of leaves are the other important symptoms. The crown gets reduced in the advanced stage of the disease. In several cases, root (wilt) diseased palms are affected by leaf rot also. The disease does not kill the palm outright but reduces

its vigour and yield. It is observed to affect palms of all ages in all soil types. The exact cause of the disease is not yet clearly known. However, association of virus, fungi, bacterium and nematode has been implicated with the disease.

A varietal screening programme with emphasis on the yield and disease tolerance is in progress under a set of better management practices. In the light of the observations emerging therefrom a four-pronged strategy for the management of the disease has been worked out which consists of (1) adaptive research with a view to containing the disease within the present geographical limits, (2) rehabilitation of affected plantations by adopting a set of package of practices developed for improving the productivity of the affected gardens, (3) gradual elimination of the disease by selective eradication and re-planting programmes and (4) intensification of the investigations on the cause and control of the root (wilt) disease.

## CONTAINING THE DISEASE

- (i) *Effect of eradication of diseased palms on further appearance of disease*

Complete eradication of diseased palms in mildly affected gardens was attempted from 1971 onwards. The three young palms in Shencottah (Tamil Nadu) and one palm in Nadathara (Kerala) were uprooted and burnt. Subsequent observations for over 11 years showed no further

occurrence of disease in these gardens. Removal of all disease affected palms and replanting done in an area of three ha at the Research Station brought down the disease incidence in the new planting to 12.5 per cent compared to 35 per cent incidence observed in underplantings done with similar material in a heavily diseased area.

The Field Station of CPCRI (established in Irinjalakuda in 1979 and recently shifted to Trichur) removed 400 diseased palms from 213 gardens distributed in eight villages situated along the northern basin of the Karuvannur river during the years 1979–80. The boles were dug out and the leaves and dug-out-roots were burnt *in situ*. A total of 1409 palms growing around these diseased palms was treated with Temik 10(G) @ 100 g and Bavistin @ 7.5 g per palm twice a year. Of these, only 14 palms developed the disease symptoms in 1981 and 22 palms in 1982. But, among the untreated palms, 114 palms manifested the disease in 1981 and 42 palms in 1982. These observations indicate that systematic roguing of the diseased palms may help to reduce further occurrence of the disease. The effectiveness of plant protection treatments in checking the disease, although encouraging, needs further confirmation.

Encouraged by these field observations a series of discussions were held with the State Agricultural Department, Kerala Agricultural University and the then Directorate of Coconut Development. It was felt that in view of the magnitude of the problem, the complex nature of the disease and in the absence of an effective method of cure, adoption of measures to check the further spread of the disease is an urgent necessity. The operational strategy to be followed was total removal of all root

(wilt) affected palms beyond Karuvannur river so as to eliminate centres of infection and thus reduce the chances of spread of the disease towards north. Accordingly, the CPCRI Field Station conducted a preliminary survey and located 400 diseased palms in the eight villages on the northern bank of the Karuvannur river, and the majority of palms was located at Varandarappalli and Amballur. In 1980 and 1981 disease incidence was located in distant gardens as far as on the banks of Bharathapuzha. A detailed garden to garden survey of 254 villages in Trichur, Palghat and Malappuram districts was, therefore, programmed and started in April, 1982 with the massive support of State Agriculture Department and Kerala Agricultural University. About 130 palms distributed in 33 villages were identified as diseased. The farthest points of disease incidence in the north at the time of this survey were Ponnani in Malappuram district and Pothundi in Palghat district. So far 908 disease affected palms in 14 villages have been removed after paying a compensation of Rs.75/- per palm. Good quality seedlings were supplied free of cost for replanting and the surrounding palms within 15 m<sup>2</sup> treated with Temik and Bavistin.

Since isolated pockets of disease were detected in Thandorappara near Perambra in Quilandi taluk of Kozhikode, a rapid survey was organised on a priority basis with the active support of State Agriculture Department, Kerala Agricultural University and Centre for Water Resources Development and Management in 60 villages of Quilandi and Badagara taluks; 51 root (wilt) diseased palms distributed in four villages were identified. Arrangements to remove these palms are under way.

In Tamil Nadu, random occurrence of the disease was detected at Kulasekharam

and Ponmanai villages in Kanyakumari district and Vallom village near Shencottah in Thirunelveli district. Recently, the disease was noticed in Coimbatore also. The need to assess the extent of the disease incidence as well as measures to be taken to check the further spread of the disease has been communicated to the Director of Agriculture, Tamil Nadu.

(ii) *Need for internal quarantine on planting materials*

Information collected from the cultivators on the source of planting material revealed that in some cases the seedlings had been brought from root (wilt) affected areas. There is also experimental evidence to show that coconut roots and/or soil can carry the root (wilt) infection. Thus, there is an urgent need for imposing internal quarantine measures to prevent the movement of coconut seedlings from root (wilt) affected to disease-free areas.

## MANAGEMENT OF THE DISEASE

Experiments have shown that the infected palms responded to better management like organic recycling, addition of plant nutrients etc.

(i) **Organic recycling**

A research project on mixed farming (raising fodder crops in the interspaces and maintaining milch cows) in a disease affected coconut garden over a period of five years has shown that regular recycling of organic matter (farm yard manure) increased the mean yield of palms by 26 per cent.

This has also resulted in significant increase in the status of soil organic carbon, exchangeable calcium, magnesium and potassium as well as soil microbial activity.

## Effect of mixed farming on the yield of coconut

Disease index	Yield of nuts per palm per year		Percentage increase
	Pre-treatment	Post-treatment	
0-10	50.3	68.4	36.0
11-25	33.7	42.3	25.5
26-50	22.5	24.5	8.9
Above 51	19.0	23.7	24.7
General Average	31.4	39.6	26.1

(ii) **Mixed cropping**

In an experiment on mixed cropping coconut with cacao conducted in a diseased garden for five years under irrigation and recommended doses of fertilizers for both the crops, the yield of coconut increased from an average of 17.6 nuts per palm per year to 46.0 as shown below:

### Mean yield of nuts per palm per year

1976	1977	1978	1979	1980
17.6	22.2	27.8	37.9	46.0

Mixed cropping of cacao increased the soil fertility in the gardens. The deterioration of the palms by the disease was slowed down. The overall increase in the yield of palms was 30%. The net income increased by about 25-30% by single or double hedge system of planting of cacao in the diseased gardens.

### (iii) Intercropping

Experiments conducted on the feasibility of intercropping tuber crops with coconut in the root (wilt) affected tracts have revealed an increase in the mean yield of palms particularly with yam and elephant foot yam. The estimated net response in the increase in percentage of yield was 17.57 and 8.04, respectively, for elephant foot yam and yam.

### (iv) Soil amendments

The fertilizer trials recently conducted at CPCRI Farm, Kayangulam, showed that regular additions of Mg at the rate of 3.0 kg magnesium sulphate (500 g MgO) per adult palm per year along with normal dose of NPK fertilizer right from the time of planting in the main field increased the vegetative growth of young palms at a highly significant level and reduced their prebearing age by about 9 months. Addition of magnesium sulphate also prevented the development of foliar yellowing and increased the yield of nuts by about 40 per cent in the early bearing periods. The beneficial effects of Mg were more evident on root (wilt) affected palms than on healthy.

### (v) Performance of D x T and WCT under good management

A comparative assessment on the performance of WCT and D x T palms under good fertilizer management (500g N, 300g P<sub>2</sub>O<sub>5</sub>, 1000g K<sub>2</sub>O and 500g MgO per palm per year) in the root (wilt) affected area showed that D x T hybrids are more productive and have a lower incidence of disease compared to the ordinary WCT palms as evidenced by the data given below:

Year after Planting	Disease incidence %		Average yield of nuts/palm/year	
	WCT	D x T	WCT	D x T
4	2.2	1.8	Nil	Nil
5	4.3	3.6	Nil	75
6	8.8	5.0	Nil	129
7	22.5	5.0	17	90
8	29.3	8.9	40	118
9	35.5	22.1	50	112

### (vi) Varietal reaction to the disease

A varietal screening programme to evaluate the yield potential and resistance/tolerance to root (wilt) disease has been in progress since 1972 in the Institute farm and in cultivators' gardens with 92 cultivars / hybrids. The performance of these materials with respect to disease incidence and yield is being watched.

### (vii) Plant Protection

Though root (wilt) disease is not amenable to usual plant protection measures regular spraying with fungicides could significantly reduce the incidence of leaf rot superimposed on the wilt.

This is evident from the observation given below:—

### Mean percentage of leaf rot affected palms during different years of spraying (1976–1981)

1976	1977	1980	1981
40.17	32.0	20.9	7.8

## **ELIMINATION OF DISEASE BY SELECTIVE ERADICATION**

During 1979–1981 Kerala Agricultural Department uprooted about 28,000 root (wilt) affected palms between the Chalakudy and the Karuvannur rivers by paying Rs.75/– per palm as compensation. The farmers were supplied with good quality seedlings and fertilizers for the first three years at 50 per cent subsidy.

## **INTENSIFICATION OF RESEARCH ON CAUSE AND CONTROL OF ROOT (WILT) DISEASE**

CPCRI Regional Station, Kayangulam conducts research on diseases and pests of coconut with special accent on root (wilt) disease. There are 29 ongoing projects dealing with this complex disease, of which six form part of the Kerala Agricultural Development Project operating with the World Bank aided funds. About 30 scientists are engaged on a multi-disciplinary approach to solve this complex problem.

The laboratories house the units of plant pathology, microbiology, nematology, soil science, plant physiology, entomology and

biological control of insect pests of coconut. These are reasonably well equipped with ultramicrotome, ultracentrifuge, refrigerated centrifuge, spectrophotometer, scintillation counter, gas chromatograph, lyophiliser, laminar flow, colorimeter, pH meter, research microscopes, steady state porometer, dewpoint microvoltmeter, vapour pressure osmometer, a radio-isotope laboratory and a cold room. An electron microscope is being added.

## **FUTURE THRUST**

The future stress on research of the Centre will include the elucidation of the cause of the disease by a process of confirmation / elimination of the biotic agents already implicated through transmission experiments and persistent electron microscopic studies, perfection of a fool-proof method for the detection of the disease before the manifestation of visual symptoms, intensification of the efforts for the development of appropriate management practices for root (wilt) affected coconut plantations and last but not the least large scale varietal screening programme for isolating disease tolerant types, the practical solution for this kind of a complex malady.