

YELLOW LEAF DISEASE OF ARECANUT

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1. Historical background

The exact period when the yellow leaf disease of arecanut was first observed is not known. However, the occurrence of the malady in the Meenachil areas of the erstwhile Travancore State along with the coconut 'root and leaf' disease was on record as early as 1934. Since then the disease was reported from diffe-

rent pockets of Kerala and in the early sixties from the Malnad areas of Karnataka. It is now known to be prevalent in all the arecanut-growing districts of Kera a in varying proportions and in the Koppa and Sringeri taluks of Chikmagalore District and Sullia Taluk of South Kanara District of Karnataka. The worst affected districts of Kerala are Kottayam, Idukki, Trivandrum and Quilon could be seen in Table I.

TABLE I
Area under arecanut and % area affected by yellow leaf in Kerala

District	Area under Arecanut '000 ha.	Percentage of area affected
Cannanore	16.58	1.20
Kozhikode	8.10	0.70
Malappuram	15.50	Negligible
Palghat	3.70	Not available
Trichur	15.10	6.30
Idukki	1.70	97.00
Ernakulam	7.80	34.10
Kottayam	5.40	94.30
Alleppey	5.10	Not available.
Quilon	9.20	75.40
Trivandrum	4.50	71.80
Total	92.68	35.80

Organised research on this malady was begun in 1959 with the establishment of the Regional Arecanut Research Station at Palode. Research on certain basic aspects of the disease were also taken up at the Central Arecanut Research Station, Vittal. A multidisciplinary approach to tackle this problem was however initiated only with the establishment of the Central Plantation Crops Research Institute in 1970.

2. Salient research findings

The first visible symptom of the disease is the yellowing at the tips of leaflets in two or three leaves of the outer whorls. The majority of the roots (upto 70%) of palms in the advanced stage of infection are rotten. The endosperm of the affected nuts has a blackish appearance and is soft to touch. It is not a sure symptom as some of the nuts of the diseased palms might have the normal colour. Female flowers, buttons and immature nuts are shed heavily affecting the yield considerably. A reduction in yield to the extent of

50% on account of the disease over a period of 3 years immediately after the incidence has been reported. Observations recorded over a period of eleven years from 1961 to 1972 in Kerala State revealed rapid and indiscriminate spread of the disease without any definite pattern. A technique has now been evolved for quantifying the severity of the disease based on visual symptoms.

A number of fungi such as *Exosporium arecae*, *Leptosphaeria* sp., *Diplodia* sp., *Phyllosticta* sp., *dimersporina* sp., etc. were isolated from the leaves. Roots of the diseased palm yielded *Trichoderma* sp., *Pestalotia* sp., *Aspergillus* sp., *Fusarium* sp., *Colletotrichum* sp., *Acrimonium* sp., and *Cylindrocladium* sp. None of these fungi were found to be pathogenic on arecanut. Diseased palms given basal application of chemicals viz. Blue Copper 50, Cupramar, Furadan, Metham Sodium, Brassicol Vitavax and Bavistin did not show any improvement in their condition with respect of disease symptoms. Association of the bacterium *Pseudomonas* sp with the disease has also been reported.

Serological and biochemical tests conducted have indicated the presence of a virus in the diseased leaf sap. Subsequent studies have showed the presence of MLO in the affected leaves. Diseased palms treated with antibiotics, however, failed to show any improvement. A survey on the association of plant parasitic nematodes revealed that there has been no correlation between the presence of *Radipholus similis* and the disease. Presence of multinucleate cells and disturbed tissue differentiation have been observed in the diseased leaf tissue. Occurrence of tyloses blocking the xylem vessels has been frequent in the affected plants.

But the role of the suspected biotic agents has to be established by means of Koch's postulates. The limited number of samples examined at Indian Agri-

cultural Research Institute, New Delhi, and the Rothamsted Experimental Station, England have not revealed the presence of any pathogen in electron micrograph though there is on record the presence of MLO under E.M. by other workers.

Extensive surveys of healthy and affected gardens of Kerala and Karnataka revealed that the nutrient contents do not differ significantly between healthy and diseased samples in respect of both leaf and soils. However, some differences in nutrient status have been noticed between samples of both the States.

Table II below gives mean values of chemical analysis of healthy and diseased soil and leaf samples.

TABLE II

A. Mean value of Element content of Arecanut Soils of Palode

pH		Organic carbon %		Available N (ppm)		Available P ₂ O ₅ (ppm)		Available K ₂ O (ppm)	
H	D	H	D	H	D	H	D	H	D
5.395	5.325	1.740	1.550	145.760	130.050	2.93	3.33	61.65	57.14

B. Mean Value of Element Content of Arecanut Leaves of Palode

Nitrogen %		Phosphorus %		Potassium %		Calcium %		Magnesium %	
H	D	H	D	H	D	H	D	H	D
1.476	1.287	0.411	0.381	0.918	0.869	0.705	0.792	0.775	0.770

H : Healthy

D : Diseased

The Kerala gardens are lower in fertility status than those of Karnataka. The soils of both the States are high in organic matter, low to medium in available P & K and contained adequate levels of Fe, Mn, Zn and Cu. Karnataka soils are neutral in pH while Kerala soils are slightly acidic. The contents of N, P, K, Ca, Mg, Fe, Zn and Cu in leaf samples from Kerala have been found to be lower than in those from Karnataka. Application of NPK fertilizers + micronutrients have not improved the condition of diseased palms at Palode. A comprehensive package plan trial using all major and micronutrients carried out in ryots' gardens in Kerala and Karnataka showed no tangible improvement in the general condition of the palms by way of either reduction in foliar yellowing or in the quality of Kernel. Though the yield of the treated palms registered a decrease in majority of the treatments in Kerala, a general improvement in yield has been noticed in almost all the treatments in Karnataka. Diseased palms given foliar application of urea, diammonium phosphate and manganese sulphate have not improved the foliar condition or yield.

Fiftytwo indigenous and exotic collections of arecanut were planted in 1961 onwards at Palode in order to assess their field reaction to the disease. None of them have been found to be tolerant. Twentyone diallel crosses tested in the field since 1976 also failed to show any tolerance to the disease.

3. Research programmes at hand

The foregoing account reveals that the etiology of the disease is uncertain and the control measures are yet to be evolved. Several new experiments have therefore been formulated and they are in progress at the Central Plantation Crops Research Institute. These include (1) association of phythiaceous fungi with the disease, (2) an integrated chemical control trial using fungicide, bactericide and nematicide, (3) a monitoring trial, (4) root feeding with chemicals and growth regulators, (5) a mixed farming trial with grass and dairy to study the effect of organic recycling on disease; (6) Management of diseased gardens by application of higher dose of fertilizers and (7) field reaction of hybrids in relation to disease incidence and yield.