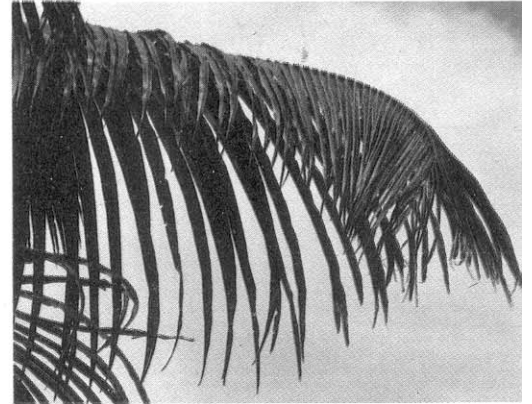


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# Combating important Diseases of Coconut



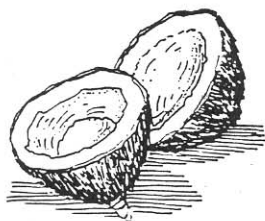
Slow killer of the palm, the root-wilt in advanced stage (*left*), when it is best to do away with the palm. Flaccidity or ribbing, a consistent symptom of the disease (*below*).



Leaf-rot is usually superimposed on root-wilt in coconut farms. It is caused by a number of fungi and spreads rapidly in the rainy season in early stage (*top*). It may be controlled by Vitavax and Difoltan in combination with Aureofungin. Acutely-affected palms (*right*) should be isolated, removed and burnt.



*In coconut, only those diseases caused by fungi and nematodes have really been understood. The etiology (aetiology) of the major diseases is uncertain — attributable to both pathogenic and non-pathogenic factors. The diseases often express similar symptoms; more baffling is the equally similar predisposition of the palm.*



### Defining diseases on the coconut

**T**HE coconut within the country is prone to the root-wilt, leaf-rot, bud-rot, Thanjavur-wilt, Tatipaka and stem-bleeding. The **root-wilt** disease recorded around 1874 in the erstwhile Travancore state of Kerala became devastating after the floods of 1882. It is contiguous and spreads to 410,000 ha comprising 8 southern districts of Kerala. In Kanyakumari and Coimbatore in Tamil Nadu it occurs in isolated pockets. To the other coconut-growing areas the disease is virtually unknown. The **leaf-rot** of coconut occurs normally superimposed on root-wilt affected palms, seen for the first time in 1880 in parts of the erstwhile Travancore and Cochin. In fact 16-40 per cent of the leaf-rot disease is found in the root-wilt affected palms. Widespread in distribution, the **bud-rot** disease is sporadic in occurrence, particularly intense in regions with high relative humidity receiving the south-west and north-east monsoons—its intensity, up to 6.5 per cent in Kerala and 1.45 - 3.6 per cent in the east coast of Tamil Nadu. In west Godavari, Krishna and Chittoor districts of Andhra Pradesh, bud-rot is scattered affecting the palms from 0.9 to 10.0 per cent; in Karnataka, Goa and Maharashtra, the bud-rot has been noticed only where a large number of young palms exist. **Thanjavur-wilt** drastically limits production of coconut in Tamil Nadu. The wilt was first noticed in a big way after the cyclones of 1952 and 1955 in Thanjavur, therefore the name. The disease now grips one-third of the



Coconut palms everywhere and at any stage are threatened by bud-rot caused by *Phytophthora palmivora* Butler. *Top*: Treated and cured palm. *Left*: Of uncertain etiology, stem-bleeding may apparently be due to unfavourable soil conditions and caused by *Thielaviopsis paradoxa*. Affected discoloured tissues should be cut and removed by a sharp chisel. Dress the surgery with cold coal-tar or Bordeaux paste.

coastal coconut gardens, spreading gradually to newer plantations in the interior of Tamil Nadu and adjoining Kerala. Confined generally to the black alluvial soil, the **Tatipaka** threatened the coconut growers in 1952, after the 1949 cyclone in Tatipaka village of Andhra Pradesh. The incidence of the disease is between 0.2 and 17.2 per cent. Stem-bleeding of coconut palms is known in all coconut-growing regions of the country irrespective of soil and climate; an expression of abnormality owing perhaps to a variety of factors than any specific one. The symptoms of the disease differ distinctly from each other. Since the causal organisms are fairly understood, definite

strategies to combat the maladies have been programmed.

### How do they show up on the plant?

#### Root-wilt

Bending or ribbing of the leaflets in the central and outer whorls of leaves known as flaccidity is the earliest consistent visual symptom of coconut root-wilt. Foliar yellowing and marginal necrosis set in with the age of the palm and intensity of the disease. Based on an indexing method the diseased palms may be classified into early, middle and advanced categories. Major- and micro-nutrient balance has no direct bearing on disease incidence though fungi, bacteria and nematodes have been observed in the diseased palm tissues. But, inoculation of these organisms individually and in combination do not produce the symptoms characteristic of the disease in coconut seedlings planted in sterile soils in large field tanks. In the early sixties, the disease was thought to be of viral etiology, disproved totally later. Instead Mycoplasma-like organisms, located in the brain and salivary glands of the lace-bug *Stephanitis typica*, a common sucking insect on coconut foliage, gained belief due to their total presence in the root-wilt diseased palm tissue and their total absence in the disease-free palms. In insect-proof conditions, lace-bugs could transmit the disease to the young coconut palms which exhibited typical visual symptoms of flaccidity. Indirectly too, mycoplasmal etiology favouring the disease has been proved, since Oxytetracycline treatment is effective in reducing the impact of root-wilt on affected palms. The effect of the treatment is however reversible.

**To combat:** Diseased juvenile palms, irrespective of the intensity of the disease, and all adult palms in the advanced stage in the heavily infected tracts should be eradicated. This should be followed by a suitable insecticide spray to prevent the insect vec-

tors from spreading the pathogen. Young palms getting affected before the onset of flowering fail to bear properly while the disease-advanced palms just do not respond to management practices for sustaining productivity. By a process of systematic replanting and underplanting the number of palms in unit area may be restricted to an optimum of 175 palms/ha. Fertilization consisting of 0.5 kg N, 0.3 kg P<sub>2</sub>O<sub>5</sub>, 1.0 kg K<sub>2</sub>O and 0.5 kg MgO in two split doses with farmyard manure or compost @ 50 kg per palm per year plus raising of green-manure crops *Peuraria* in the basins is essential. Intercropping with the least-competing crops like yam, ginger and colocasia in rotation, or resorting to mixed farming, fodder crops and milch cow, in the diseased coconut gardens would help in recycling of organic waste. Besides, leaf-rot (normally superimposed in root-wilt affected gardens), pests, prevention of waterlogging to overcome lack of aeration in the soil and regulation of excessive shading are a part of the package for checking the root-wilt.

#### Leaf-rot

It is not fatal. But, the palms decline and become unproductive as the disease advances. It is particularly grave during June, July and September. Fungal spores adhere to the tender leaflets and germinate producing tiny brown spots. The spots enlarge and coalesce affecting tender parts of the leaflets, rotting extends to the interior portion of the spindle. As the spindle grows the rotted portions dry up and turn black in the sun and break off with a gust of wind. Rotting proceeds unhindered towards the base of the leaflets. Though the basal portions of the affected leaflets do not show symptoms, the leaves appear fan-like. The ends of the leaflets and midribs appear black and shrivelled. Unchecked, the disease continues to spread on successive spindles. *Bipolaris halodes*,

*Gleosporium* sp., *Curvularia* sp., *Diplodia* sp., *Gliocladium roseus*, *Pestalotia* sp. and *Fusarium* sp. have been isolated from the infected leaves. *Bipolaris halodes* is most virulent, initiating the rotting *in vivo*.

**To combat:** Apply fungicides particularly to the tender leaves before the onset of monsoon. For cure and as a preventive measure fungicides should be sprayed thrice a year: in January, May and September. Before application, it is necessary to cut and burn the affected leaflets. Sequential spraying with Bordeaux mixture (1 per cent), Dithane M 45 (0.3 per cent) and Fytolan (0.5 per cent) controls leaf-rot. It is advisable to spray all the coconut gardens in a locality.

#### Bud-rot

Bud-rot is a fatal disease affecting coconut palms and is directly related to the microclimate—relative humidity and temperature—in the leaf axils. Microclimate of the young palms (5-20 years) is more favourable for the incidence of the disease. The earliest symptom of the disease is the yellowing of one or two young leaves surrounding the spindle. While the spindle withers and droops down, the cabbage rots into a slimy mass emitting a foul odour. Even after the destruction of the central bud, the outer leaves continue to remain intact for several months. *Phytophthora palmivora* Butler is the established species causing the disease. The disease perpetuates through mycelia in the tissues and through oospores and spreads through sporangia and zoospores.

**To combat:** If the disease is detected in the early stage, infected tissues should be removed thoroughly by cutting off the spindle along with the surrounding leaves. The cut portion should be covered with Bordeaux paste and covered with a polythene sheet till a fresh shoot emerges. Badly affected palms and those beyond recovery may be cut and burnt. As a prophylactic measure, all healthy

palms in the vicinity of the diseased palm may also be sprayed with Bordeaux mixture. It is difficult to detect bud-rot in its early stage. Prophylactic measures are therefore recommended.

### Tatipaka disease

The coconut cultivation in Andhra Pradesh is considerably affected by the Tatipaka disease, which is slow but debilitates the palm. The disease is prominently noticeable in palms of 25-40 years. Sporadic but contiguous, the Tatipaka spreads at a very slow rate of 3.5 per cent in 5 years. Its symptoms are: reduction in number and size of leaves and leaflets, pale green foliage, fasciation of leaves, chlorotic spots on leaves, abnormal bending of fronds, tapering of stem and formation of smaller inflorescence with small atrophied nuts. Ultimately the palms become barren. The diseased palms may not exhibit all symptoms at a time; that may also vary from palm to palm. However, reduction in the number and size of leaves and leaflets, atrophied nuts and pale green foliage are consistent and associated with all diseased palms. In the tissues of the diseased palms Mycoplasma-like organisms, confined to phloem, have also been seen. Response to Oxytetracycline group of chemicals is yet to be confirmed.

**To combat:** Various chemical and hormonal treatments have not helped in improving the Tatipaka-affected palms. Although, a spray of urea and zinc sulphate does improve the colour of the foliage but without any increase in yield. A mixture of sand, silt and farmyard manure heaped around the bark above the bole induces root regeneration and checks the disease from turning severe. A comprehensive management practice offers application of fertilizers @ 480:320:1200 of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O and 1 kg magnesium sulphate along with 25 g of Borax/palm/year and culturing green manure in the basin around the hole recycles organic matter that together help in ameliorating the

counterproductive effects of the disease.

### Thanjavur-wilt

Thanjavur-wilt spreads from a particular focus of infection towards the periphery in a concentric manner, primarily through root contact of the diseased and healthy palms. Repeated ploughing and flood irrigation also spread the disease. Withering, yellowing and finally drooping of leaves in the outer whorls are the characteristic initial symptoms. Root decay extends up to the bole. Yellowing and withering extend to the inner whorl of leaves and a reddish viscous fluid exudes from the basal portion of the trunk. The bleeding patch enlarges and traverses upwards, up to 4 m sometimes. Most leaves and bunches droop and the nuts fall. In a few diseased palms in the advanced stage, brackets of *Ganoderma lucidum* have been observed in the base. Many fungi have also been isolated from the diseased palm tissues. *Ganoderma lucidum* is believed to be the probable causal organism for Thanjavur-wilt. Palms of 10-30 years are more susceptible and the disease occurs in the coastal sandy or sandy loam soils. It is intense in regions experiencing soil moisture stress in summer followed by waterlogging during the rainy season.

**To combat:** Stumps of dead and disease-advanced palms should be removed, the bole and roots burnt. Affected tissues in the bleeding patches should be chiselled with coal-tar. The palms in the early or middle stages of the disease should be isolated from the neighbouring healthy palms by digging trenches 1-m deep and 30-cm wide to prevent any contact. Fertilizer (500:300:1200 NPK/palm/year) should be applied in two split doses in May and August. The organic matter content in the soil should be increased by incorporating farmyard manure. Each palm should be fed with 5 kg neem cake every September. The diseased palms may be root fed Aureofungin sol 2 g + 1 g copper sulphate in 100 ml water thrice a year: in

July, October and January. To contain the disease and to prevent its spread, seedlings grown in infected areas should not be transported to healthy areas. The affected palms should be removed if the occurrence of the disease is sporadic.

### Stem-bleeding

Prevalent in all parts of the country, stem-bleeding in coconut is the exudation of a reddish-brown liquid through cracks on the trunk a metre above the ground. It may extend up to the crown, when the disease is severe. On drying, the liquid turns black, all the internal tissues becomes smaller, production is reduced considerably and the palm dries up. Usually palms of 20 years and above are affected. Earlier thought to be caused by the fungus *Ceratostomella paradoxa*, it is now for sure to be caused by *Thielaviopsis paradoxa*. Characteristic symptoms of stem-bleeding were reproduced in palms inoculated with the fungus *T. paradoxa* in Kasaragod, Appangala and Vittal. The organism was reisolated from the tissues obtained from the inoculated palms.

**To combat:** Remove rotted material surrounding the bleeding patches and smear the wounds with Bordeaux paste. Burn the infected garbage. Stem-bleeding occurs in waterlogged areas. Hence, proper drainage of the gardens is essential. In drought-prone gardens, intercultivation by digging or ploughing and proper manuring are helpful. Proper cultural operations and regular manuring will offset the adverse effect of the disease to a considerable extent.

In coconut prevention is better than cure and boosting the health of the palm even better since complete eradication of any disease is tough.

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