

THEY STILL ELUDE THE RESEARCH SLEUTHS

Cadang-Cadang, Lethal Yellowing and Root Wilt, dread diseases of the coconut palm that strike only to inflict lingering death have defied so far all efforts at finding their causes although research workers of many countries are hot on the trail of the killers

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A number of countries in the tropics are engaged in coconut cultivation and the palms in these regions are affected by various diseases. In the Caribbean Islands, Panama, Florida, Togoland, the Philippines and India the coconut palms are affected by certain diseases of unknown origin. Of the six such diseases some appear to be

somewhat related to each other, while others have nothing in common. While the devastating effects of these diseases continue, strenuous efforts are being made to find out the cause or causes of these diseases. A number of specialists are engaged in this work and a lot is known about each of these diseases but much more has to be known to remove

the veil of mystery surrounding them and to suggest practical methods of control. International organisations like the FAO are taking keen interest in these investigations and rendering the utmost assistance.

Three Major Diseases

Three major diseases with little known or unknown etiology are dealt with here. In the Philippines which is the foremost coconut-growing country in the world there occurs a widespread devastating disease known as *Cadang-cadang*. Next in severity and in the extent of area covered is the "unknown disease" of the Caribbean Islands and Central America. Third comes the root (wilt) disease of Kerala in India.

Cadang-cadang

Cadang-cadang means dying-dying. Though indiscriminately used by the cultivators to indicate various disorders with yellowing of leaves as the chief symptom the name is specially used to denote a particular infectious type of disease of unknown origin. It is not known for certain when the disease made its first appearance in the Islands. With the evidence in hand it is regarded that the disease first appeared in the north-west tip of San Miguel Island about 1926. The disease has now spread to vast areas of the Philippines and has devastated millions of coconut palms. (Fig. 1).

Cadang-cadang never appears on seedlings and only infrequently it appears on young palms. The affected palms usually die after 5-10 years of appearance of the symptoms. Irregularly shaped bright yellow or orange spots on leaves mark the beginning of

the disease. With its progress the spots are enlarged and become more numerous. Bright conspicuous patches appear on the older leaves. The leaflets become stunted and brittle, and tend to break in the middle, (Figure I A) followed by rapid drying and drooping. The nuts on the infected palm lose the original shape, become undersized and are produced in abnormally large numbers at first. A slow decline sets in later and the fruit production ceases totally. The flower bunches are also adversely affected. Female flowers either fail to set fruit or the fruits never mature. Inflorescence shortens and carries only male flowers. The upper part of the feeder roots breaks down rapidly in the early stage of the disease. In the later stages the crown is reduced to 8-10 stiff short upright bronze yellowish leaves in a tuft at the top of the stem with a few drooping older leaves about to fall from the trunk. Eventually the bud is killed and the bare stem stands testimony to the extent of damage. Affected palms are not known to recover.

Investigations have shown that the disease is neither caused by fungal or bacterial infection, nor by insect injuries. Nutritional imbalance and toxic effect of certain soil components are also found not to be responsible for the disease. A virus has been considered to be the pathogen though it still remains to be confirmed. No proper control methods are known. Destruction of the diseased palms alone is recommended.

Lethal Yellowing

This disease was first noticed in Jamaica in 1872. While the disease

affects coconut palms in Jamaica most seriously it has also been noticed in Haiti, Bahamas and Cuba of the Caribbean Islands and Florida in Central America. It is also known as the "unknown disease" mainly because of its unknown cause. It was first confused with the bud-rot disease of coconut and was named the "western end bud rot" disease (Figure II).

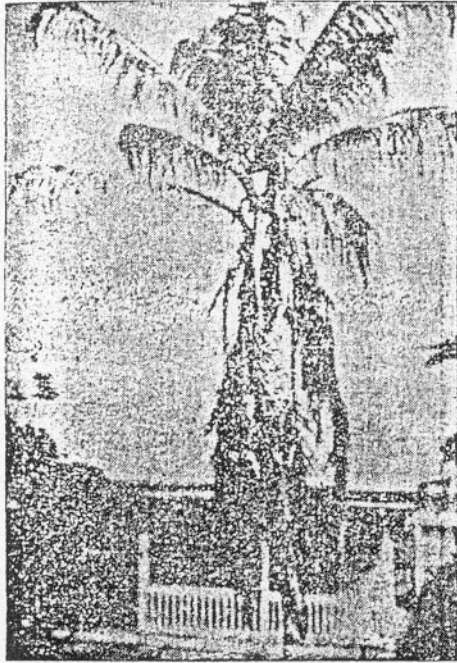
Premature shedding of nuts is the earliest symptom of the disease. The crown becomes yellowish brown by progressive discoloration of the leaves. Bronzing of fronds starts from the lower leaves until they become yellow. Discoloration and drying of the inflorescence also occur. (Figure II A) The leaves dry and droop and the production of fruits ceases. It takes nearly 3-4 months for the bud to die after appearance of the primary symptoms of the disease. The heart fronds fall down and the surrounding ones stand upright for a while but wither away rapidly leaving a bare trunk. The possibility of bacterial or fungal infection as the cause of the disease has been ruled out and it is suspected that a virus may be actively involved. No control measures are known. The Malayan dwarf variety of coconut is resistant to this disease.

Root (wilt) Disease

The root (wilt) disease, locally named as '*Kattuveezhcha*' is known to have made its first appearance in the erstwhile State of Travancore more than 80 years ago, after the great floods of 1882. The disease is said to have made its appearance at two independent foci of infection, one in Mecnachil Taluk and the other in the coastal tracts of

Quilon District. Spreading slowly but steadily from these initial foci of infection the disease now covers nearly one lakh of acres in the districts of Trivandrum, Quilon, Alleppey, Kottayam and Trichur. It is continuing to spread both north and south (Figure III).

Extensive damage has been done to palms of all ages by this disease. The disorder affects all the tissues and retards their normal functioning. Though the infected palms are seldom killed degeneration sets in which affects the yield so much that the palms have to be finally destroyed within 10-15 years of the appearance of the first symptoms. Seedlings below the age of three years usually do not show signs of infection. Palms in the pre-bearing stage are the most susceptible. The leaves of the infected palms show abnormal bending with flaccid leaflets. (Figure III A) The leaflets may show necrosis especially along the tips and the margins. It starts as yellow specks which later enlarge and coalesce, and darken. In bearing palms an abnormal nut-shedding often appears as a primary symptom. Production of nuts may be reduced to nil and the spathes wither away. The nuts produced by diseased trees show poor quality fibre and less oil content. The root system of the infected palms is very badly affected, decay of the roots sets in and production of newer roots is considerably reduced. All roots especially the tender ones show rotting from their terminal end upwards. Early investigators were led to think that the disorder was primarily due to root decay. Fungal organisms associated with the decayed portions supported this view. But the fungi are now regarded to have

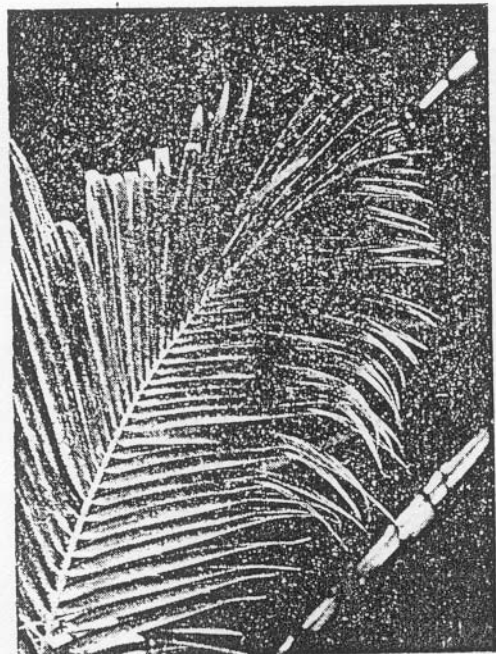


Coconut palm in advanced stage of Lethal Yellowing.



Lethal Yellowing in advanced stages. Blackened necrotic inflorescence and collapsed heart fronds may be seen.

*Coconut palm attacked by the
Root (wilt) disease.*

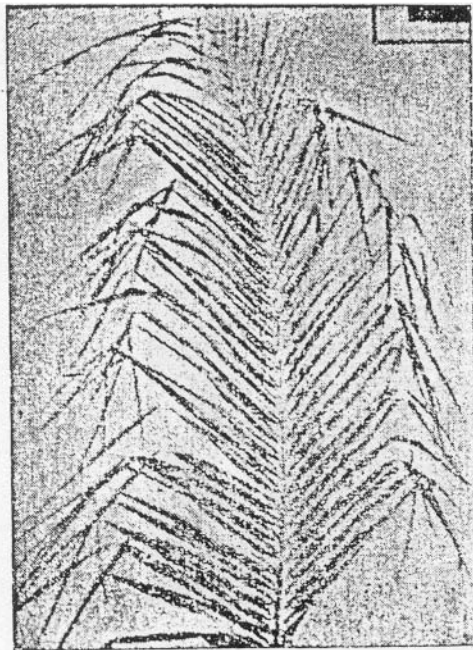


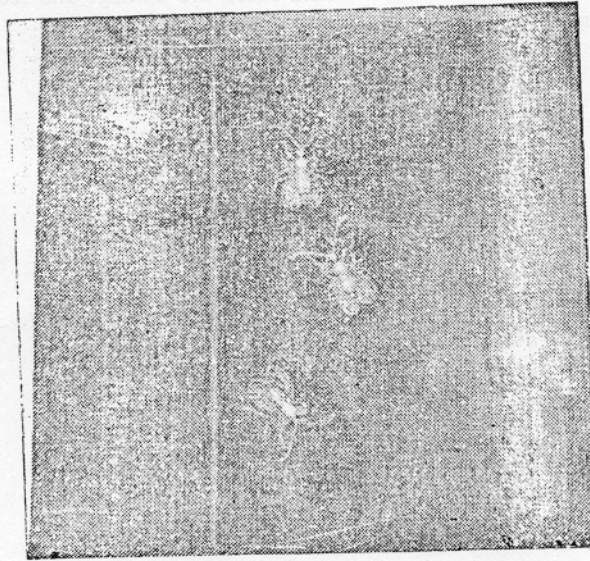
*Flaccidity of leaflets, an early
symptom of Root (wilt)
disease.*



Coconut palm in advanced stage of Cadang-cadang.

Leaflets become stunted and brittle and tend to break in the middle in a Cadang-cadang affected palm.





The banana lace wing bug which is said to transmit the virus supposed to be responsible for the Root (wilt) disease.

only secondary importance. Imbalanced soils or the deficiency of any major or micro nutrients have not been found to be the principal factor for the cause of the disease. The disease is found in all types of soil. Physical conditions of the soil are found to exert an adverse effect on the health of the palm and prolonged waterlogging and poor drainage are considered as predisposing factors. A mechanically transmissible virus has been isolated from the diseased palms and it appears to play an important role in the

etiology of the disease. The virus is known to be transmitted by the banana lace wing bug (Figure III B) which breeds on coconut palms also. The virus has also been found to infect the soil under the diseased palms. No definite methods of control can yet be recommended at this stage; but it will be desirable to cut down, uproot and burn the badly infected palms. Improved cultural and manurial practices would check the damage and reduce the losses to some extent.
