



THE ROOT (WILT) PROBLEM OF COCONUT

A PHYSIOLOGICAL APPROACH

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Root (wilt) disease, the most serious malady affecting coconuts, is posing an economic threat to Kerala, the land of Coconuts. Nearly one third of the seven lakh hectares under coconut crop in the State is affected by this devastating disease. The annual loss incurred due to this malady has been estimated to be approximately 340 million nuts, valued at about 50 crores of rupees. The disease is almost a century old and is reported to have been first detected in 1882 after a heavy flood in three isolated pockets of Central Kerala in Kottayam and Alleppey districts. It has, since then, spread, in all directions and has at present reached up to Trichur in the north and Trivandrum district in the south.

The characteristic external symptoms of the disease are general wilting of leaves with yellowing and marginal necrosis of leaflets. The abnormal

bending or ribbing of leaflets, often termed as 'flaccidity' is another typical feature of the disease. Palms of all ages are affected by this disease. It is debilitating in nature but not lethal. It gradually reduces the yield of nuts, ultimately rendering the palm nearly barren.

The etiology of this complex disease is still unknown. It is suspected to be the combined effect of pathogenic microorganism, nutrient imbalance and internal water stress. Though the disease is observed in all soil types, symptoms of the disease are more pronounced in those areas with poor soil aeration and waterlogged conditions. The disease is mostly prevalent in places where the water table is high, the depth of the soil is shallow and in places where drainage facilities are meagre and unsatisfactory.

Physiological and biochemical investigations have revealed

a number of derangements in the disease affected palms. A crippled root system, characterised by extensive root decay and disorganised vascular elements has been a prominent feature of the disease. Water economy of the diseased palm was found upset. Reduced uptake and upward transport of water, increased rate of transpiration, higher moisture content and more number of stomata in the leaves indicated an internal imbalance in the water economy of the disease affected palms. Loss of permeability of the root and leaf cells, and increased rate of respiration have been observed in diseased palms. Accumulation of non-protein nitrogen in the leaves, reduced rate of photosynthesis, lower chlorophyll content and less activity of carbonic anhydrase enzyme are some of the other derangements observed in diseased palms. Carbohydrate metabolism was also found affected in disease affected

palms. Total and reducing sugars have been found to be significantly higher in the leaves of disease infected palms; but a depletion of these sugars in roots have been observed in diseased palms. This indicated a possible block in the translocation and distribution of sugars in diseased palms. Whether these metabolic derangements are the effects of the disease or the changes which predispose the palms to disease, is not clearly understood.

Since no pathogenic organism has so far been identified to be the definite cause of the disease, physiological and biochemical investigations have now assumed greater importance. It is well known that investigations on the etiology of any disease is incomplete without unravelling the physiological and biochemical changes associated with disease. Indirectly but with authenticity, such studies will help to give clues to the nature of the disease.

A recent study by the scientists of the physiology division revealed certain closely associated symptoms of the disease. The disease is often detected by three symptoms, namely the flaccidity, necrosis and yellowing of leaflets. These symptoms might sometimes appear on healthy palms growing in shades or in waterlogged conditions. Under such circumstances healthy palms may be confused for diseased ones. In order to get rid of this difficulty, certain additional symptoms like whitening and softening of the

spindle leaf with necrotic spots on them, interveinal yellowing of the middle whorl of leaves and presence of more number of senescent leaves have now been indentified. A biochemical test has also been developed to detect the disease in its early stages. This test has been found suitable only in 75 per cent of the cases tested. So, attempts are now under way to modify and make this test fool-proof.

Intensive investigations on water relations, root decay and root regeneration, dry matter production, button shedding etc. are being carried out with a view to collecting more information on the physiology of this serious disease. Recently radioisotopes have also been pressed into service to study the absorption and translocation pattern in root (wilt) affected palms. Multiple approaches have been made in order to control this menacing disease. Several compounds, e. g. 1182 F, B-naphthoxy acetic acid, Phenyl acetic acid, 2-4Dichlorophenoxy acetic acid, 2-4 methyl indole butyric acid, Indole propionic acid, urea, calcium chloride, iron, copper, sodium etc. were injected into the diseased trees. A number of nutritional and manurial trials were conducted. Increased doses of N, P, K and Ca and application of organic manures like cowdung and groundnut cake were tried. Micronutrients singly and in all possible combinations were given to diseased trees. The palms were fed through artifi-

cially induced roots on the trunk. None of these treatments cured the disease. However, foliar application of two per cent magnesium sulphate at quarterly intervals has been found to be very effective in curing foliar yellowing, found associated with the root (wilt) disease. So also, intercropping root (wilt) affected coconut with fodder crops and recycling animal wastes under mixed farming conditions resulted in increased production of inflorescence, female flowers and consequent increase in yield of nuts to the tune 28%.

A recent experiment conducted at CPCRI, Regional Station, Kayangulam by the Physiology group of scientists revealed that ascorbic acid, certain phenols like gallic acid and caffeic acid and some micronutrients, not only reduced the symptoms of the disease but also increased the yields of the disease affected palms. Encouraged by the results of this limited experiment, a large scale experiment has now been started in the farmers' field to ascertain further, the curative effect of these chemicals. Initial observations indicated that ascorbic acid alone and in combination with phenols and Naphthalene acetic acid are effective in reducing the symptoms of the root (wilt) disease. These chemicals will, however, be recommended to the cultivators only after fully testing their efficacy with respect to their curative property and improvement in nut yield.