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Root (Wilt) Management In Coconut

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Introduction

Coconut (*Cocos nucifera* L.) is affected by a number of maladies- while some of them are lethal, others are debilitating in nature. Phytoplasma (formerly known as Mycoplasma like organisms, MLOs) belonging to class *Mollicutes* are wall-less, pleomorphic, unicellular, nutritionally fastidious, phloem limited, vector transmitted phytopathogens with a mean diameter of 200-800nm and genome size ranging from 530-1350kb. Due to the paucity of distinct phenotypic criteria, currently its classification is based on sequencing and RFLP analysis of the conserved 16S rDNA region.

The occurrence of root (wilt) disease of coconut was first noticed in 1882 in Kottayam district of Kerala. Later during 1907, the disease was reported from Pathanamthitta and Alappuzha district of Kerala. Since then, the disease has spread all districts of Kerala state and bordering districts of Tamil Nadu, Goa and Karnataka. The annual loss due to the disease was estimated to be about 968 million nuts and the monetary loss assessed in terms of loss in husk, copra yield and leaf on the basis of 1984 price index of coconut was of the order of about Rs.3000 million. Root (wilt) disease is non-lethal but debilitating. If the palms are affected at the seedling stage, flowering is delayed and also yield is considerably reduced. The reduction in yield of nuts up to 80% has been reported in palms in the advanced stages of disease.

Symptoms

In general, flaccidity, yellowing and marginal necrosis are the predominant symptoms. Affected leaflets become curved and bent downwards along the entire length and form a structure resembling the ribs of mammals. Reduction in the number of leaves and successive leaves become smaller, shorter and narrower resulting in the stunting of plants and reduction in the size of coconuts. Rotting of roots is considered to be one of the major symptoms. Flowering is delayed when palms were affected

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severely. The spadixes are small, weak and do not open normally and drying of spath and necrosis of spikelets occur from tip to downwards. Shedding of immature nuts and poor quality of nuts/copra from the affected trees can reduce the yield potential. Unopened pale-yellow leaflets of spindle leaves are more susceptible to leaf rot disease and causes reduction in photosynthetic area, disfiguration of the palms and reduction in yield apart from attracting a number of insects that feed, multiply and cause further damage

Etiology

The causal organism of root (wilt) disease of coconut was established as phytoplasma by electron microscopy (EM), transmission studies with vectors, transmission through dodder and light microscopic staining techniques. The phytoplasma was detected in sieve tubes of roots, tender stem, petiole and developing leaf bases of root (wilt) diseased palms by EM. Remission of symptoms observed in tetracycline treated palms added further evidence to the phytoplasmal etiology of the

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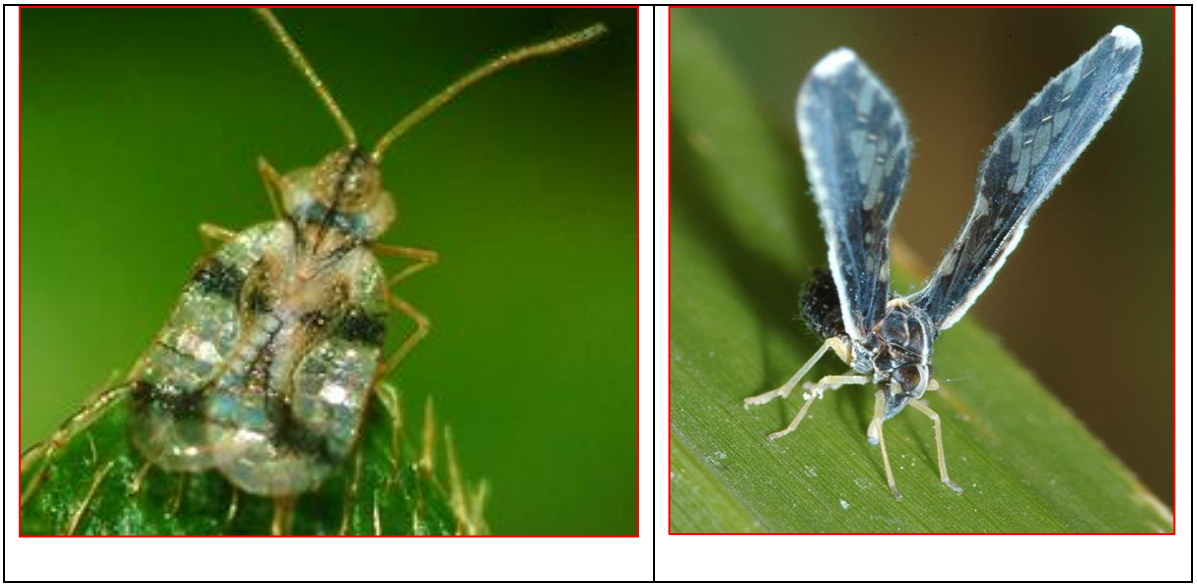
disease. The phytoplasma causing RWD has been characterized as "*Candidatus Phytoplasma oryzae*" related strain belonging to 16SrXI-B sub group (rice yellow dwarf group).

Transmission

Phytoplasmas are generally transmitted by insects belonging to the Hemiptera group. The disease is transmitted by phloem feeding lace wing bug (*Stephanitis typicus*) and plant hopper (*Proutista moesta*).



lace wing bug (*Stephanitis typicus*) plant hopper (*Proutista moesta*)

Detection techniques

Accurate and timely diagnosis of plant diseases is an essential component of integrated disease management. Direct Antigen Coated-Enzyme Linked Immunosorbent Assay (DAC-ELISA) is used for the detection of RWD phytoplasma even 24 months before symptom manifestation. Molecular detection of phytoplasma associated with RWD was achieved by using highly specific primers, semi-nested PCR technique and real -time PCR.

Management

The perennial nature of the crop coupled with the persistence of the pathogen once acquired and the possible transmission in brief duration of feeding by the vectors rule out the effective prevention of the spread of the disease by control of vector. Since the phytoplasma is not amenable to culturing *in vitro*, screening of chemicals for adopting control measures is not at all feasible. Diseased palms treated with Tetracycline hydrochloride exhibited only temporary remission of symptoms and needs to be applied repeatedly. Prohibitive cost of the antibiotic and caution against its indiscriminate use for treating any plant disease are the other limitations of its use.

One of the significant features of this disease is that it is not lethal but a slow declining malady that responds to ideal management practice. The loss can be reduced to the minimum if palms could be attended immediately on appearance of symptoms. Two strategies, one for the heavily diseased contiguous area, and another for the mildly affected area have been formulated.

The yield of palms can be sustained or even improved through adoption of integrated management practices:

Integrated management strategies for coconut root wilt disease

- Continuous monitoring of the plantation for root wilt disease incidence.
- All disease advanced and uneconomic palms with annual yield of less than 10 nuts are to be removed
- Replanting with disease free quality seedlings or seedlings of coconut resistant/ tolerant varieties (Kalpasree, Kalparaksha) and hybrid (Kalpasankara) released by ICAR-CPCRI for cultivation in the root (wilt) disease prevalent areas
- Provision of proper drainage facilities and complete eradication of severely diseased palms. Application of 50 kg farm yard manure, 5 kg neem cake, 1.3 kg urea, 2 kg super phosphate and 3.5 kg of murate of potash per tree per year in two equal splits at six months intervals.
- Soil application of 100 g *Trichoderma asperellum* and 100 g *Bacillus subtilis* by mixing with 5 kg farm yard manure per tree at three months intervals.
- Soil application of 100 g *Azospirillum*, 100 g *Phosphobacteria* and 50 g VAM fungus mixing with 5 kg farm yard manure per tree at six months intervals will help plants in better nutrient uptake.
- Root feeding of TNAU coconut tonic @ 40 ml per tree mixed with 160 ml of water at six months intervals.
- To manage the leaf hoppers and lace wing bug, neem powder 200 g or fipronil 0.3 G mixed with equal proportion of sand should be applied at the base of the crown.
- Pour hexaconazole 5 EC (2.0 ml + 300 ml water) in the crown region at 45 days intervals for managing leaf rotting symptom.
- Mass multiplied ‘Cococon’ from Tamil Nadu Agricultural University should be applied @ 2 litre per tree mixed with 8 litre water at three month intervals around root zone. For mass multiplication, 5 lit mother culture of ‘Cococon’, 10 kg jaggery, 5 litre curd and 500 gram

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sodium chloride (common salt) are to be mixed with 150 lits of water and grown for 5-7 days by covering the container with gunny bags

- Irrigation with 250 L of water/ palm/week and provide soil moisture conservation and adequate drainage wherever necessary.

Conclusion

Phytoplasmal diseases continue to be a serious threat to the coconut cultivation as they are non-curable. Coconut root wilt is a severe disease that poses a threat to coconut palm cultivation and the livelihoods of many people who depend on coconuts. It is imperative to contain the spread of the disease within the current geographical limits by appropriate quarantine measures. Periodic surveillance in the diseased tract and monitoring for new incidence of disease and prompt removal will go a long way in arresting fresh outbreaks. The best option to control phytoplasma diseases is evolving disease resistant/ tolerant planting material and efficient robust diagnostic tools are very important for early detection of the disease for screening mother palms. Implementing comprehensive management strategies, including vector control and early detection is crucial to mitigate its impact.

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