

Studies on spear rot disease of oil palm in Kerala, India

I. Establishment of phytoplasma etiology and yellow leaf disease affected arecanut as the source of inoculum

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Abstract

Experimental transmission of phytoplasmas (Mycoplasma-like organisms) associated with spear rot disease (SRD) of oil palm in Kerala, India from oil palm to oil palm and yellow leaf disease (YLD) affected arecanut to oil palm was attempted using dodder laurel, *Cassytha filiformis* L. Positive transmission by symptom reproduction was observed in five oil palm seedlings after 10-18 months of bridging to SRD-affected oil palm and two out of four oil palm seedlings bridged to YLD affected Areca palm. Electron microscopic detection of phytoplasmas in all the seedlings which have expressed symptoms confirmed the transmission of this disease.

Key words: Oil palm, spear rot disease, phytoplasma, yellow leaf disease, transmission, etiology

Introduction

Spear Rot Disease (SRD) of oil palm (*Elaeis guineensis* Jacq.) is characterized by chlorosis and necrosis of young leaves, rotting of spear leaves, complete loss in productivity and further growth of the palm. Constant association of phytoplasmas with the diseased palms and their conspicuous absence in healthy palms indicated the presumptive phytoplasma etiology of this disease (Kochu Babu, 1993).

Experimental transmission of phytoplasma of palms have been attempted and in a few cases found successful too. Tsai (1983) could not transmit phytoplasma associated with lethal yellowing disease of coconut using *Cuscuta campestris* Yunck. However, Sasikala *et al.* (1988) reported positive transmission of coconut root (wilt) disease (RWD) using the unconventional dodder species, *Cassytha filiformis* L.

Since the information on transmission is not available in the case of spear rot disease of oil palm, transmission of the phytoplasmas from diseased oil palm to healthy oil palm using *C. filiformis* was attempted and the results are described in this paper.

The yellow leaf disease (YLD) and root (wilt) disease (RWD) are of phytoplasma etiology (Nayar and Selisakar, 1978; Anonymous, 1984; Solomon *et al.*, 1983; Anonymous, 1992). Though the symptoms on arecanut, coconut and oil palm are different from one another, the presence of phytoplasmas in all the three palm diseases, the occurrence of the disease on oil palms bordering the YLD and RWD areas and the presence of the phloem feeding Derbid, *Proutista moesta* (Westwood) on all the three palm species prompted Kochu Babu and Ramachandran Nair (1993) to implicate a possible relationship among these three diseases. Moreover, there

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is a clear declining gradient of disease incidence on oil palms from the periphery towards the interior of the oil palm plantations (Kochu Babu, 1993).

Materials and Methods

The dodder laurel, *C. filiformis* raised from seeds was established first on periwinkle (*Catharanthus roseus* G. Don) raised from seeds sown on sterile soil, under insect proof conditions and used as feeder plants, in order to establish the parasite on diseased as well as on healthy oil palms.

Ten tenera oil palm seedlings raised from sprouts in sterile soil in pots and maintained in insect proof conditions were used as recipient plants. Fresh laurels/twines established on SRD palms were bridged to tender leaflets and rachis of healthy seedlings at weekly intervals for about 8 to 10 months. Similarly, four *tenera* oil palm seedlings of four months age raised from sprouts in pots containing sterile soil and maintained under insect proof conditions were used for the transmission study from areca to oil palm. Fresh laurels of dodder established on YLD affected arecanut palms were bridged to young leaves of the recipient healthy oil palm seedlings and monitored for symptom expression. Presence of phytoplasmas in dodder laurel, donor and recipient palms was checked by light microscopy (Deeley *et al.*, 1979) and electron microscopy (Solomon *et al.*, 1983) whereas for control seedlings only light microscopic detection was carried out. Equal number of oil palm seedlings of the same age raised in sterile soil under insect proof conditions served as control.

Results and Discussion

The dodder laurel established well on oil palm leaflets of young fronds in one to two months putting forth efficient haustoria to reach vascular bundles. Five out of the ten recipient oil palm seedlings bridged to SRD expressed typical symptoms of foliar chlorosis, rotting of spear leaves and arrest of growth after 10-18 months. The recipient diseased seedlings continued to deteriorate as seen in typical cases of field palms. The presence of phytoplasmas in the donor, connecting dodder laurel and recipient diseased seedlings was confirmed by Diene's staining. Positive transmission has been further corroborated by the detection of Phytoplasmas in vascular elements of root tissues of diseased recipient seedlings under electron microscopy.

Sasikala *et al.*, (1988) could successfully transmit phytoplasmas associated with coconut root (wilt) disease to periwinkle, the phytoplasma indicator host using *C. filiformis*. Similarly, yellow leaf disease of arecanut,

another Phytoplasma disease, also could be transmitted to arecanut bridged through dodder laurel (Solomon, 1993).

Reproduction of symptoms in the healthy oil palm seedlings bridged to diseased oil palm through *C. filiformis* and the detection of phytoplasmas in the donor and recipient palms and connecting dodder laurel confirms the transmission of the disease through dodder laurel.

Two out of four recipient oil palm seedlings expressed typical symptoms of SRD in 8 and 11 months after bridging on to YLD affected areca palms. Positive staining reaction indicating phytoplasma infection was noticed in root tissues of donor and recipient palms and dodder laurel when viewed under light microscope. Detection of phytoplasmas in root tissues of both these palms by electron microscopy further confirmed transmission. The phytoplasma bodies observed in tissues of YLD affected areca palm were similar to the ones observed in oil palm. In this context, it is pertinent to point out Butler's observation (Butler, 1908) with reference to the RWD that in Kerala the palm disease was first noticed on arecanut palms and later on coconut in the same garden.

The experimental transmission of phytoplasmas from YLD affected arecanut to oil palm using *C. filiformis* as evidenced by symptom reproduction and detection of phytoplasmas in root tips of the recipient oil palm seedlings confirmed that YLD is a source of inoculum for SRD of oil palm in the field. This warranted not only a close monitoring of oil palms planted near YLD affected arecanut tracts in Karnataka, where SRD is not observed so far, but also to refrain from under planting in YLD affected areca garden.

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