

ADDITIONAL FUNGI ASSOCIATED WITH LEAF ROT DISEASE OF COCONUT IN INDIA (A RESEARCH NOTE)

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Leaf rot is a severe disease predominantly superimposed on root (wilt) affected coconut palms in India. The disease is aligned under fungal etiological complex and the fungal species composition reported previously. The additional fungi isolated viz. *Thielaviopsis paradoxa*, *Rhizoctonia solani*, *Mortierella elongata*, *Curvularia* sp., *Acremonium* sp., *Thielavia microspora*, *Thielavia terricola* and *Chaetomium brasiliense* have been reported and their pathogenic role or otherwise indicated. Among the aforesaid fungi, *T. paradoxa* and *R. solani* are considered relatively notable in the context of leaf rot disease complex. These two fungi independently induced symptoms leading to rotting of coconut spindle leaflets.

Leaf rot disease of coconut occurs superimposed on over 60% of root (wilt) affected palms in southern districts of Kerala State, South India (Srinivasan 1991). The symptoms of leaf rot were described by earlier workers (Joseph and Rawther 1991; Menon and Nair 1951; Srinivasan and Gunasekaran 1992). The emerging unopened spindle of the palms is generally prone to early incidence of the disease. Earlier, *Helminthosporium halodes*, *Gloeosporium* sp. and *Gliocladium roseum* were implicated with the disease (Menon and Nair 1951). However, recent investigations have brought out species composition of leaf rot complex (Srinivasan and Gunasekaran 1993a). Pathogenic nature of *Colletotrichum gloeosporioides*, *Exserohilum rostratum*, *Gliocladium vermeseni*, *Fusarium solani*, *F. moniliforme* var. *intermedium* and *cylindrocladium scoparium* in relation to the disease have since been elucidated. During this course of study more fungi were isolated and the present paper gives the extent of association of these fungi with the leaf rot disease.

The additional fungi isolated are *Thielaviopsis paradoxa* (Dade) C. Moreau (IMI 349541), *Rhizoctonia solani* Kiihn (IMI 356503), *Mortierella elongata* Linnem (IMI 352402), *Curvularia* sp., *Acremonium* sp. (IMI 350500), *Thielavia microspora* Mouch (IMI 355814) *Thielavia terricola* (J. Gilman

& E.V. Abbott) Emm (IMI 355815) and *Chaetomium brasiliense* Batista and Pont (IMI 357721) and identified at CAB-IMI., England.

To investigate pathogenic role or otherwise of the fungi, the unopened coconut spindles from root (wilt) affected palms but free from leaf rot were severed from crown and leaflet pieces/leaflets were inoculated by techniques of *in vitro* inoculation as described previously (Srinivasan and Gunasekaran 1993b). Controls were maintained for comparison. The results are given in Table 1.

Artificial inoculation of *T. paradoxa* resulted into development of symptoms in leaflet pieces/leaflets (Table 1, Fig. 1-3). Water soaked yellow lesions appeared in leaflet pieces at points of inoculation in different intensity (40-100%). The lesions with brown margins enlarged and the lamina became chocolate brown to black. Symptoms appeared in whole leaflets also 48 hr after inoculation (100%). The whole lamina ultimately rotted in 5-7 days. The fungus was reisolated from leaflet bits in medium and maximum recovery (86.67%) was observed from inoculated whole leaflets. Control leaf samples were free from symptom. The development of symptoms by *T. paradoxa* in coconut spindles and positive reisolations indicate its ability to infect such tissues. However, since in nature the fungus is isolated only at low frequency

level (Srinivasan and Gunasekaran 1993a), its exact involvement in the incidence of leaf rot in nature seems to be of minor importance.

In coconut *T. paradoxa* has been found to cause stem bleeding disease (Nambiar et al. 1986) and certain foliar diseases such as bitten leaf in Jamaica (Bain 1940) and Mauritius (Shepherd 1930), and leaf spot in Philippines (Protacio 1965). The involvement of the fungus in leaf rot is an addition to the list and this forms the 1st report of *T. paradoxa* in context of leaf rot complex.

Inoculation with *R. solani* and *M. elongata* resulted in development of wet rotting symptom in leaflets (Fig. 4-6). The infection ranged from 20-73%. Inoculation with *Curvularia* sp. resulted in the formation of very minute lesions whereas, inoculation with *Acremonium* sp., *T. microspora*, *terricola* and *C. brasiliense* did not result in any symptom production. Though some of the above fungi are able to induce symptoms in artificial inoculation, they may play only a secondary role and are not of much significance in the causation of the disease. *R. solani* is a known pathogen (Baker 1970) associated with foliar diseases (Sharma et al. 1984).

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TABLE 1

Development of symptoms in leaflet pieces and leaflets of coconut spindle on inoculation of different fungi independently and reisolations

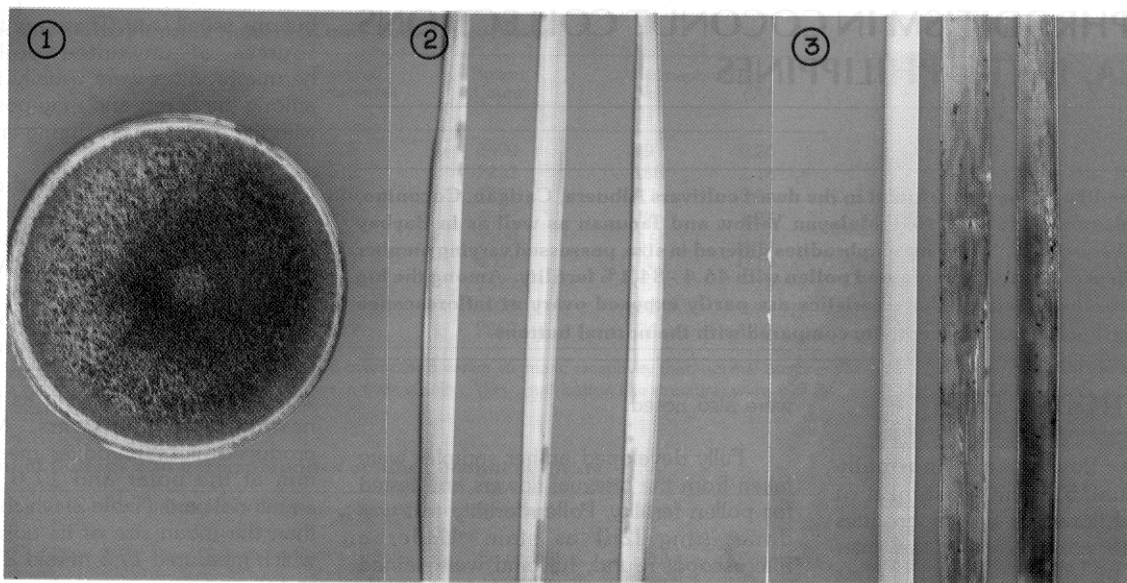
Inoculation technique Fungi	In leaflet pieces: Inoculations and reisolations				In whole leaflets (without pin prick): Inoculations and reisolations	
	No. of samples		No. of leafbits developed		No. of samples	
	developed symptom		the fungus, inoculated onto medium		developed symptom**	
	Without pin prick injury*	With pin prick injury*	Without pin prick injury*	With pin prick injury*	Without pin prick injury*	With pin prick injury*
<i>Thielaviopsis paradoxa</i>	4 (40)	10(100)	15/20 (75)	24/30 (80)	30 (100)	52/60
<i>Rhizoctonia solani</i>	3 (30)	6 (60)	11/20 (55)	15/20 (75)	22 (73)	25/40 (63)
<i>Mortierella elongata</i>	2 (20)	6 (60)	8/20 (40)	14 (20) (70)	21 (70)	20/40 (50)
<i>Curvularia</i> sp.	2 (20)	4 (40)	5/20 (25)	8/20 (40)	8 (27)	10/40 (25)
<i>Acremonium</i> sp.	0	0	—	—	0	—
<i>Thielavia microspora</i>	0	0	—	—	0	—
<i>Thielavia terricola</i>	0	0	—	—	0	—
<i>Chaetomium brasiliense</i>	0	0	—	—	0	—
Control	0	0	—	—	0	—

* Out of 10 samples in each case

** Out of 30 samples in each case

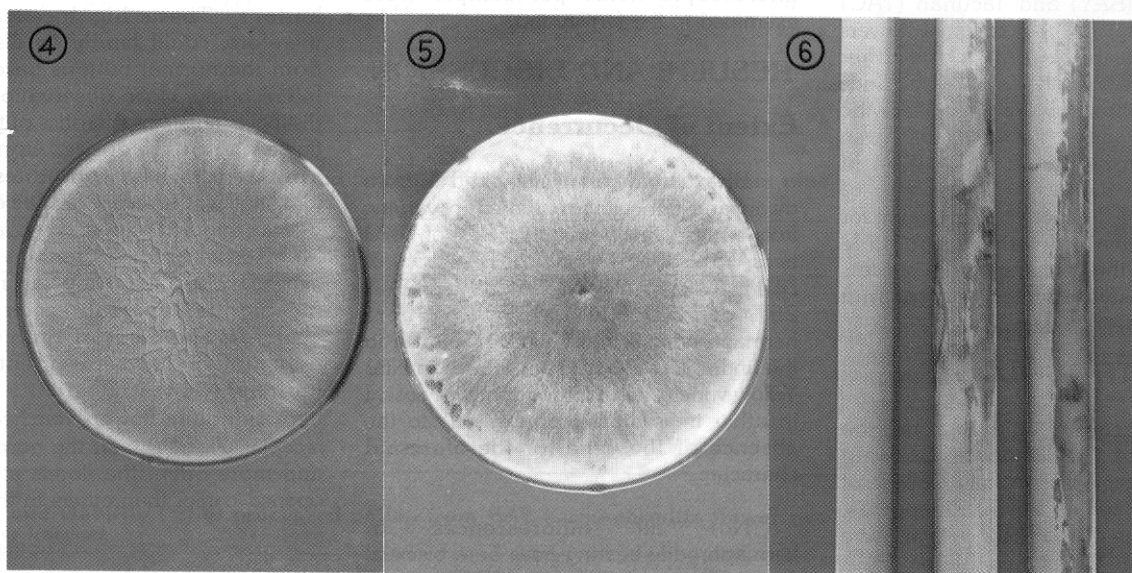
Figures within the parentheses are percentages, rounded off to nearest whole number

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FIGURES 1-3

Thielaviopsis paradoxa - Culture (1), early lesions (2) and advance rotting (3) in inoculated whole leaflets as compared to control



FIGURES 4-6

Rhizoctonia solani cultures without (4) and with (5) sclerotia, and rotting symptoms (6) in inoculated whole leaflets as compared to control

REFERENCES

- BAIN, F.M. 1940. Report on the coconut growing areas of Jamaica. Bull. Dep. Sci. Agric. Jamaica (N.S.) 22:12 pp.
- BAKER, K.F. 1970. Types of *Rhizoctonia* diseases and their Occurrence. In *Rhizoctonia solani: Biology and Pathology* (ed. John R. Parmeter), pp. 125-148. Los Angeles, University of California Press.
- JOSEPH, T. and T.S.S. RAWTHER. 1991. Leaf rot disease. In *Coconut Root (wilt) disease*. Monograph Series No.3 (ed. M.K. Nair et al.), pp. 81-89. CPCRI, Kasaragod, India.
- MENON, K.P.V. and U.K. NAIR. 1951. Scheme for the investigation of the root and leaf diseases of the coconut palm in South India. Consolidated final report of work done from 8th March 1937 to 31st March, 1948. Indian Cocon. J. 5(1): 5-19.
- NAMBIAR, K.K.N., Y. JOSHI, M.N. VENUGOPAL and R. CHANDRAMOHAN. 1986. Stem bleeding diseases of coconut. Reproduction of symptoms by inoculation with *Thielaviopsis paradoxa*. J. Plant, Crops 14:130-133.
- PROTACIO, D.B. 1965. The *Ceratostomella* (*Thielaviopsis*) *paradoxa* leaf spot new in the Philippines. Philipp. J. Agric. 25: 67-75.
- SHARMA, J.K., C. MOHANAN and E.J. MARIA FLORENCE. 1984. Two mycelia sterilia parasitic on foliage of hardwood seedlings in Kerala State, India. Trans. Br. Mycol. Soc. 82:342-343.
- SHEPHERD, E.F.S. (1930). Botanical Division. Ann. Rept. Mauritius Dept. Agric. for the year 1928, pp. 10-13.
- SRINIVASAN, N. 1991. Occurrence of coconut leaf rot in relation to root (wilt) disease. Indian Cocon. J. 21 (10): 14-18.
- SRINIVASAN, N. and M. GUNASEKARAN. 1992. An appraisal of symptom expression in coconut due to leaf rot disease. Indian Cocon. J. 23 (7):2-6.
- SRINIVASAN, N. and M. GUNASEKARAN. 1993a. Fungi associated with leaf rot disease of coconut. Indian Cocon. J. 23(10): 2-7.
- SRINIVASAN, N. and M. GUNASEKARAN. 1993b. Identification of *Colletotrichum gloeosporioides*, *Exserohilum rostratum* and *Gliocladium vermoeseni* associated with leaf rot disease of coconut in India. Cord (communicated).