

PATHOGENICITY OF PREPONDERANT FUNGI ASSOCIATED WITH LEAF ROT DISEASE OF COCONUT

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Summary

Pathogenicity of predominant fungi associated with coconut leaf rot viz., *Colletotrichum gloeosporioides*, *Exserohilum rostratum*, *Gliocladium vermoeseni*, *Fusarium solani* and *F. moniliforme* var. *intermedium* and also *Thielaviopsis paradoxa* was evaluated *in vivo* in potted healthy seedlings and field palms of apparently healthy as well as root (wilt) categories, individually and in certain combinations. Pathogenicity of all these fungi were confirmed. Among the fungi *C. gloeosporioides* and *E. rostratum* were aggressive and produced intense lesions on root (wilt) diseased palms. Based on the evidences obtained, the above two fungi are considered as the core/primary pathogens of leaf rot and a circular diagrammatic representation of etiological/association proximity of various fungi presented.

Introduction

The coconut palm is attacked by different pests and diseases and among them leaf rot is considered as one of the devastating problem; the disease superimposed on root (wilt) affected palms in southern districts of Kerala State (Radha and Lal, 1968; Srinivasan, 1991). The initiation of disease symptoms is usually discerned in spindles of affected palms (Srinivasan and Gunasekaran, 1992). Earlier investigations lead to an understanding of fungal etiological relationship with the disease (Menon and Nair, 1951; Radha *et al.*, 1961).

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(1963) assessed the quantitative pattern of fungal association and species composition of the disease under an umbrella of fungal complex. Based on frequency association 14 species of fungi were grouped into three categories (Anonymous, 1994). Hence *Colletotrichum gloeosporioides*, *Exserohilum rostratum*, *Gliocladium vermoeseni*, *Fusarium solani* and *F. moniliforme* var. *intermedium* were connoted as predominant species and among rest *Thielaviopsis paradoxa* had drawn considerable weightage. The aforesaid fungi were recorded in different intensity of leaf rot also (Srinivasan and Gunasekaran, 1995 a).

Mycoflora detected in spindles of leaf rot affected palms is also in confirmation of fungal complex nature (Srinivasan *et al.*, 1995). The predominant species behaved as more associative than antagonistic *in vitro* (Srinivasan and Gunasekaran, 1995 b). Even as the general pathogenic nature of the fungi are evident it was desired to evaluate *in vivo* pathogenic ability to qualify potential species among them. Hence the present study was undertaken.

Materials and methods

One week old cultures of *C. gloeosporioides* (Cg), *E. rostratum* (Er), *G. vermoeseni* (Gv), *F. solani* (Fs), *F. moniliforme* var. *intermedium* (Fm) and *T. paradoxa* (Tp), isolated from leaf rot affected tissues and grown in potato dextrose agar medium, were utilized in comparative pathogenicity experiment. The fungal inocula were prepared as

described (Srinivasan and Gunasekaran, 1994). The six species of fungi were thus subjected to study their pathogenic role.

The experiment was conducted during June-July in four year old potted healthy seedlings and five year old apparently healthy as well as root (wilt) affected field palms, free from leaf rot. Inoculations were performed with individual fungi and in two combinations as Cg + Er + Gv + Fs + Fm and Cg + Er + Gv + Fs + Fm + Tp. The youngest leaf (spindle) of each plant was inoculated using cotton wool impregnated with inoculum at selected sites. The replications of inoculations were: 20 seedlings per fungus/combination in case of seedlings; 5 apparently healthy and 5 root (wilt) affected field palms as the case may be per fungus/combination. The inoculated leaves were covered with polyethylene covers for 48 hours. Equal number of controls in each category were maintained for comparison.

The primary objective had been to elucidate ability of different fungi towards experimental induction of lesions, the initial symptoms of leaf rot for comparisons. Therefore development of disease lesions was monitored and reisolations performed one week after inoculation, and overall comparative/competitive behaviour among the fungi drawn.

Results and Discussion

In this experiment, the pathogenic state of all six fungi were confirmed. Development of disease

lesions in inoculated young leaf/spindle of seedlings and field palms is presented in Table 1. *C. gloeosporioides* singly expressed lesions in 18 out of 20 potted seedlings followed by *E. rostratum* (16); lesser in case of other fungi. The expression of lesions was also recorded in higher number of seedlings (16-18) under mixed fungal inoculations. In field palms, except one apparently healthy under

inoculation of *F. solani*, all palms - with or without root (wilt) - developed lesions but the disease expression was found generally intense in root (wilt) category suggesting predisposition. *C. gloeosporioides* and *E. rostratum* were relatively aggressive among species of fungi.

In reisolations from seedlings, *C. gloeosporioides* was recorded from higher number of leaf pieces

(30/50) followed by *E. rostratum* and *F. moniliforme* var. *intermedium* (25 each). In field palms too higher recovery of *C. gloeosporioides* and *E. rostratum* was observed besides *F. moniliforme* var. *intermedium* and *T. paradoxa*. Recovery of *G. vermoeseni* and *F. solani* from all categories of palms was generally lesser. While frequency of fungal isolations from mixed inoculated plants was higher

Table 1. Development of leaf rot lesions in young leaf/spindle of seedlings/palms on inoculations with different fungi and their reisolations *in vitro*

Sl. No.	Fungi	No. of seedlings/palms developed lesions			Reisolations: No. of leaf pieces developed relevant fungi***		
		Healthy seedlings*	Healthy field palms**	Root(wilt) affected field palms***	Healthy seedlings	Healthy field palms	Root(wilt) affected field palms
1.	<i>Colletotrichum gloeosporioides</i> (Cg)	18	5	5	30	35	42
2.	<i>Exserohilum rostratum</i> (Er)	16	5	5	25	27	30
3.	<i>Glocladium vermoeseni</i> (Gv)	11	5	5	12	10	12
4.	<i>Fusarium solani</i> (Fs)	9	4	5	20	21	24
5.	<i>Fusarium moniliforme</i> var. <i>intermedium</i> (Fm)	12	5	5	25	27	30
6.	<i>Thielavopsis paradoxa</i> (Tp)	14	5	5	16	30	28
7.	Mixed inoculum (Cg+Er+Gv+Fs+Fm)	16	5	5	70 ^a	73 ^c	72 ^e
8.	Mixed inoculum (Cg+Er+Gv+Fs+Fm+Tp)	18	5	5	75 ^b	75 ^d	75 ^f
9.	Control	0	0	0	-	-	-

Distribution of fungi reisolated from leaf pieces under mixed inoculum

Fungi	a	b	c	d	e	f
Cg	30	33	35	37	40	38
Er	10	10	12	8	8	11
Gv	0	0	0	0	0	0
Fsp	5	12	12	10	9	6
Tp	-	4	-	7	-	10
Cg + Er	10	10	8	4	5	3
Cg + Fsp	10	4	4	3	6	4
Er + Fsp	5	-	2	-	3	-
Cg + Er + Fsp	-	2	-	-	1	-
Cg + Tp	-	-	-	6	-	3

* Out of 20 seedlings.

** Out of 5 palms

*** Out of 50 and 75 leaf pieces plated under individual fungus and mixed inoculum respectively.

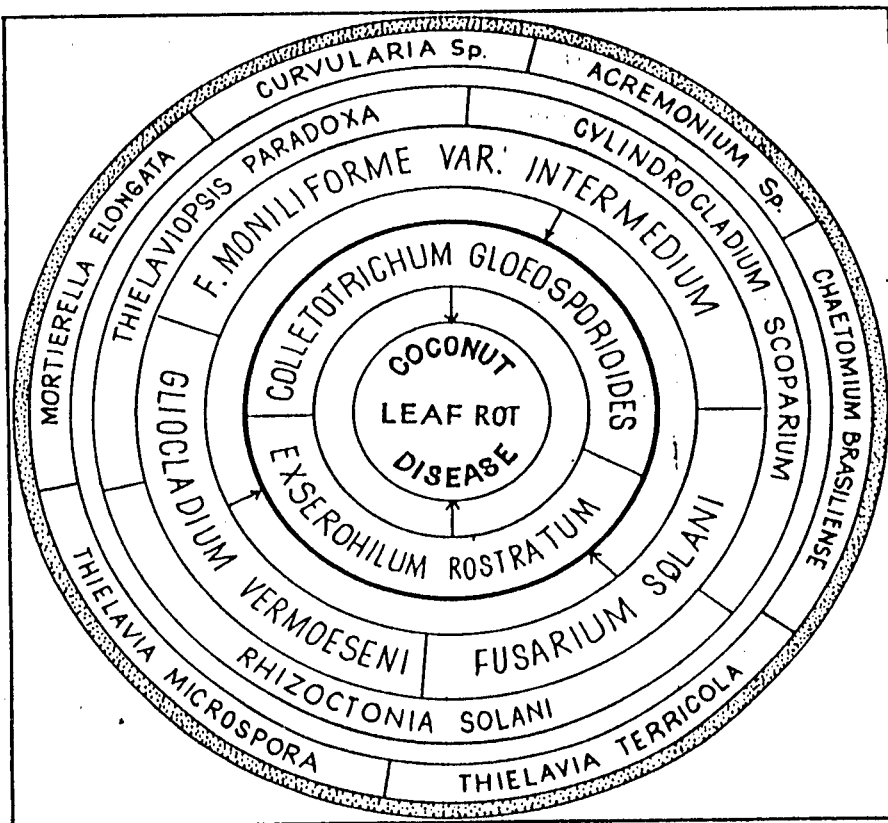


Fig. 1. Proximity of fungi associated with leaf rot (*Colletotrichum gloeosporioides* and *Exserohilum rostratum* playing primary role in the disease complex).

(70-75/75), the pattern of reisolations revealed greater recovery of *C. gloeosporioides* and *E. rostratum* either independently or in combination; *G. vermoeseni* could not be recovered.

Consolidation of facts accrued from various studies on leaf rot consistency/frequency of association with the disease, seasonal relationship, *in vitro* interactions (Srinivasan and Gunasekaran, in press), *in vivo* pathogenic competition, recovery pattern in reisolations etc. suggests that *C. gloeosporioides* and *E. rostratum* may be the core (Primary) pathogens of leaf rot complex. It is likely in diseases of fungal complexes variation in pathogenic potential among constituent species to occur and other natural phenomena determining the disease incidence/severity. In leaf rot diseased palms it is not uncommon to detect *C. gloeosporioides* and *E. rostratum* in greater

frequencies (Srinivasan and Gunasekaran, 1993).

With the current level of knowledge on leaf rot fungi (Anonymous, 1994), the associative nature of different fungal species with the disease may be documented in format of circular diagram (Fig. 1) wherein *C. gloeosporioides* and *E. rostratum* form the primary/core pathogens of the disease and other fungi in outer circles to represent proximity in decreasing order of their association. Hence leaf rot could be defined as a disease of fungal complex with the above two primary pathogens. Gaining information specially on the relative role of these two species in leaf rot and factors affecting the extent of tissue damage would be useful to devise effective disease management measures.

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