

ETIOLOGY AND RECURRENCE OF COCONUT LEAF ROT WITH SPECIAL REFERENCE TO SEEDLINGS*

N. SRINIVASAN and M. GUNASEKARAN

Central Plantation Crops Research Institute, Regional Station
Kayangulam, Krishnapuram 690 533, Kerala

A fungal complex causes leaf rot disease (LRD), *Colletotrichum gloeosporioides* and *Exserohilum rostratum* that superimposed on root wilt disease (RWD) affected coconut palms. Severe disease incidence was observed in young, field grown RWD affected seedlings. LRD was consistently reproduced in spindles of two year old RWD affected seedlings in field using the pathogens, individually and/or in combination. Pathogenic fungi produced lesions, subsequently resulted in rotting of the tissues. Lesions were observed on leaf petioles, mid-ribs/veins, both in naturally infected and artificially inoculated plants. Spindles emerged subsequent to inoculation also exhibited disease symptoms indicating their recurrence. In artificially inoculated plants, *E. rostratum* produced lesions comparatively faster. From naturally LRD infected young palms, *C. gloeosporioides*, *E. rostratum* and some other fungi were isolated, confirming the complex fungal etiology of the disease. *C. gloeosporioides* was the most frequently isolated pathogen followed by *E. rostratum*.

INTRODUCTION

Incidence of leaf rot disease (LRD) of coconut is commonly observed in root wilt disease (RWD) endemic region of Southern districts of Kerala during monsoon periods. It has been established that pathogenicity of LRD is due to complex fungal etiology, particularly, *Colletotrichum gloeosporioides* and *Exserohilum rostratum* (Srinivasan and Gunasekaran, 1996 a,b). Leaf rot disease in its early stage appears as minute, water-soaked lesions on the spindle leaf. In due course, lesion enlarges and coalesces leading to extensive rotting. Successive infection resulted in extensive damage to the canopy and deterioration of palms (Srinivasan, 1991; Srinivasan and Gunasekaran, 1992). RWD was

thus found to be a predisposing factor for the incidence of LRD. Young palms with RWD symptoms were more susceptible to LRD, even though the disease is generally noticed in palms of all ages. Influence of weather factors on the incidence of the disease and population dynamics of the pathogens were studied earlier (Srinivasan and Gunasekaran, 1996c). However, generation of more data on symptom reproduction, disease recurrence and incidence pattern of LRD in young palms especially during monsoon period was felt necessary and hence, the present study was conducted.

MATERIALS AND METHODS

Thirty numbers of two-year old field grown coconut seedlings with early symptoms of RWD, but free from LRD, were identified

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prior to onset of South-West monsoon. Pathogenic fungi, *Colletotrichum gloeosporioides* and *Exserohilum rostratum* were isolated afresh from naturally infected coconut spindles, inoculated on potato dextrose agar (PDA) medium and the fungi purified by subsequent subcultures. Inoculum from one week old cultures of these fungi was prepared in sterile distilled water (spore cum mycelial suspension) individually and/or in combination. Emerging unopened spindles were inoculated (approximately 4×10^5 spores/ml) from top downwards with the inocula prepared by slow drench. Inoculated seedlings were covered with polythene bags and cotton wool soaked in sterile water was kept inside to ensure high humidity for two days. Sequential appearance of LRD on the inoculated leaf, establishment of the pathogen(s) and possible recurrence of the disease symptoms in the next emerging spindle, etc. were monitored. First inoculation was done in July and subsequently, every newly emerged spindle was inoculated after recording the necessary observations. Multiple inoculation in individual plants was adopted to provide a steady inoculum pressure. This was continued till the end of North-East monsoon.

Severe natural incidence of LRD in RWD infected two-year old seedlings has not been reported so far. In order to generate informations on the fungi associated with diseased palms and their frequency of incidence, isolation and culture of fungi were carried out from the naturally infected palms of comparable age. Experiment was conducted by multiple sampling at monthly intervals from June to December. Every month five spindles were sampled. Fifty LRD infected leaf samples from a spindle were plated and the fungi were isolated following the standard procedure (Srinivasan and Gunasekaran, 1993).

RESULTS AND DISCUSSION

C. gloeosporioides and *E. rostratum* induced the LRD lesions consistently in the spindle leaves, when inoculated either

individually or in combination. While *C. gloeosporioides* produced minute, dark brown, angular to irregular sunken spots at early stage of the disease, *E. rostratum* induced tiny, water-soaked lesions that developed into dark brown to black, elliptical to oval spots with a yellow halo around. Centre of the spots had an off-white colour. Spindles inoculated with combination of pathogenic fungi induced both type of disease symptom. In all cases, the early lesions expanded and coalesced. Simultaneous tissue rot also set in by five to seven days after inoculation, resembling the typical leaf rot as observed in the case of natural incidence. Lesions appeared at tips, margins and lamina of the leaflets. Symptoms were also seen in leaf petioles, mid-veins/ribs of the leaflets. Lesions induced by *E. rostratum* expanded faster than that of *C. gloeosporioides* under inoculated conditions.

Pathogens were reisolated from infected tissues of inoculated spindle and their identity was confirmed. Spindles emerged subsequent to inoculation showed recurrence of the disease in a few cases. Regular recurrence of LRD symptoms in the emerging spindles were noticed in three to four palms which was caused either alone by *C. gloeosporioides* or *E. rostratum* and or by their combinations. Development of disease symptoms on leaf petiole, mid-rib/vein of leaflets upon artificial inoculation of the pathogens was not reported earlier. Typical symptoms identical to the present observations were noticed in naturally infected palms as well.

Occurrence of the two pathogens (*C. gloeosporioides* and *E. rostratum*) of LRD was found in isolations during different months of the monsoon (Table 1). The fungi were recovered from seedlings/leaf pieces either individually or in combinations. However, individual infections were more frequent than the complex form. *C. gloeosporioides* was detected in all except one palm whereas *E. rostratum* was observed only in 18 out of 35 seedlings in this period. Mean fungal recovery from leaf pieces was 54.3 per cent. *C.*

Table 1. Fungi isolated from the spindles of leaf rot affected young palms at different months during monsoon

Month	No. of palms yielding *			Fungal growth	No. of leaf pieces yielding **		
	<i>Colletotrichum gloeosporioides</i>	<i>Exserohilum rostratum</i>	Other***		Fungal Growth of		
					Cg	Er	Of
June	5	1	3	160 (64)	140	15	18
July	5	3	3	170 (68)	156	10	5
August	5	4	5	116 (46)	75	15	35
September	5	0	5	100 (40)	80	0	20
October	4	1	3	111 (44)	60	28	27
November	5	5	1	138 (55)	73	81	5
December	5	4	4	155 (62)	81	79	11
Mean	4.9	2.6	3.4		95	32.6	17.3
	C. D. P = 0.05: 1.7				C.D. P = 0.01: 35.9		

*: Five palms/ month; **: 250 leaf pieces sampled/month; ***: Other fungi includes *Glomerella vermeseni*, *Fusarium solani*, *F. moniliforme* var. *intermedium*, *Thielaviopsis paradoxa*, *Rhizoctonia solani*, *Cylindrocladium scoparium* and *Mortierella elongata*

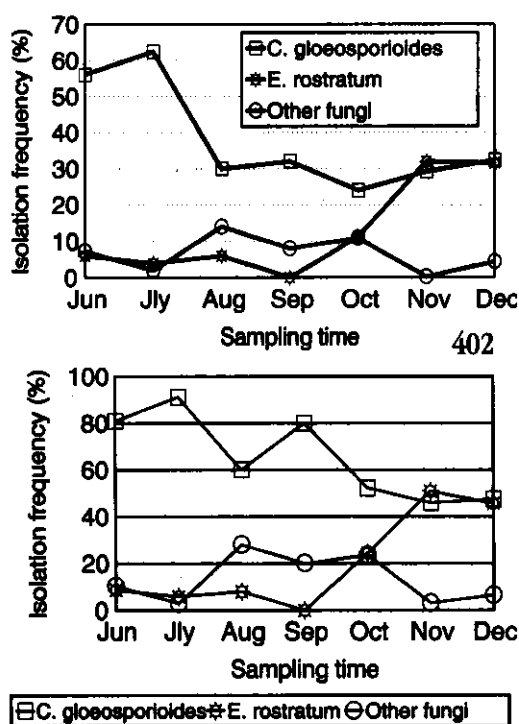


Fig.1. Frequency of fungi isolated (%) during monsoon. A. based on leaf pieces yielded fungi (C.D. P= 0.01: 21.4); B. based on total leaf pieces sampled (C.D. P= 0.01: 14.4)

gloeosporioides was identified in more number of leaf pieces as compared to *E. rostratum*. Frequency of other fungi was lower than the pathogenic fungi causing LRD (Table 1). Frequency (%) distribution of pathogenic fungi was also compared by two way computation of data. Per cent incidence of *C. gloeosporioides* was significantly higher during June to October than that of *E. rostratum*. In November and December, distribution of these species was very close (Fig. 1a,b). Hence the over-all aggressiveness of *C. gloeosporioides* in LRD during monsoon months has been ascertained.

Present study confirms the complex nature of LRD pathogens in young palms as well (Srinivasan and Gunasekaran, 1996a) and it has been found that *C. gloeosporioides* as the principal pathogen during monsoon. Though *E. rostratum* can induce LRD upon artificial inoculation, in nature *G. gloeosporioides* is distinctly active during the wet season which is in conformity with earlier report (Srinivasan and Gunasekaran, 1996c). This may be attributed to the prevailing weather conditions during monsoon favouring abundant inoculum production of the pathogen, disease development and its spread leading to intense damage to

tissues. Size and number of conidia of individual fungi may also be the other determining factors on their frequency of infections. *E. rostratum* has large size conidia and sparse sporulation and hence the possibility of slow dispersal of the pathogen, consequently only lesser frequency of infection may be expected. Weather variables such as leaf wetness and high relative humidity are particularly known to be favourable for *C. gloeosporioides* for its inoculum production coupled with small size conidia. This pathogen might have dispersed fast and established rapidly and therefore remain most common during the monsoon period.

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