

INCIDENCE OF STEM CANKER OF COCOA GROWN UNDER DIFFERENT CROPPING SYSTEMS*

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ABSTRACT

Studies on the incidence of stem canker of cocoa caused by *Phytophthora palmivora* (Butl.) Butl. under different cropping systems revealed that the incidence and severity of the disease varied with cropping systems as well as with locality. The disease incidence was the highest in cocoa-forest plantation followed by cocoa-areca mixed cropping system. Based on the point of infection, the affected trees were classified into those with collar, trunk and branch cankers. The highest number of canker lesions were observed on the main trunk. The affected trees were also classified on the basis of severity of infection by measuring the lesion size.

INTRODUCTION

In India, *Phytophthora palmivora* (Butl.) Butl. is the most destructive of all other fungal pathogens of cocoa (*Theobroma cacao* L.). Black pod disease (Ramakrishnan and Thankappan, 1965), canker (Chandra Mohanan, 1978), seedling dieback (Chandra Mohanan, 1979) and chupon and twig dieback (Chandra Mohanan, *et al.*, 1979) are the *Phytophthora* diseases of cocoa reported from India. In India, stem canker was first reported in 1978 from Karnataka State. Subsequent surveys conducted in the southern states of India in 1980 revealed the occurrence of canker in 22 per cent of the gardens surveyed (Chandra Mohanan and Kaveriappa, 1981). In recent years cocoa canker has been noticed in several gardens in Dakshina Kannada district, a major cocoa growing area in India. But no attempt has been made, so far to study the incidence and intensity of stem canker of cocoa grown under different cropping system. Hence, the present study.

MATERIALS AND METHODS

Incidence of cocoa canker in different locations in Dakshina Kannada district was recorded. For this, 15 cocoa gardens distributed in four major cocoa growing taluks of the district viz., Sullia, Puttur,

Bantwal and Belthangadi were selected after a preliminary survey of the cocoa plantation in this district. Here, cocoa is mainly grown as a mixed crop in the existing areca gardens. Out of 15 gardens selected for the present study 10 were raised as mixed crop in arecanut gardens. In general cocoa was planted at a spacing of 2.7×5.4m. Two of the gardens selected were raised as forest plantation in the West-Ghat forest. Therefore, these cocoa plants were under heavy shade. Incidence of canker were also recorded from three cocoa-coconut mixed gardens. In these gardens cocoa was planted 2.7m apart in a single row in between two rows of coconut. All the gardens were planted with foresterio variety.

A total of 2100 plants from 15 cocoa gardens were examined for the incidence of the disease. In cocoa-areca mixed gardens 1392 plants, in cocoa-coconut mixed cropping systems 368 plants and in cocoa forest plantation 340 plants were examined.

Based on the point of infection the affected trees were classified into those with collar, trunk from 12 cm above the ground level upto jorquette and branch canker. Trees showing early, middle and advanced stages of cankers were separately recorded depending on the lesion size. Canker lesion upto 5 cm length was considered early, 6-10 cm as middle and above 10 cm length as advanced stage.

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RESULTS AND DISCUSSION

Incidence of canker was the highest in Sullia taluk, where out of 1000 trees examined 51 trees were found canker affected, whereas in Puttur, Buntwal and Belthangadi taluks the canker incidence was noticed in 2, 33 and 4 trees out of the 130, 880 and 90 trees examined respectively. The incidence and severity of the disease varied from locality to locality. Friend and Brown (1971) also reported that the disease incidence in British Solomon Islands varied from locality to locality. The higher incidence of canker noticed in Sullia taluk might be due to high humidity and rainfall prevalent in this area. Climatic data were collected from the meteorological observatory in Sullia taluk. The total rainfall in this taluk during the year of study was 3810.3 mm. The mean minimum and the maximum temperature during the period of study ranged from 20.0 to 22.5°C and 31.0 to 33.0°C respectively. Cocoa canker is of great significance in high rainfall areas. (Turner and Shepherd, 1978).

The 90 infected trees observed in the district were classified into 31 trees with early, 33 with middle and 26 with advanced stages of cankers (Table 1). The disease incidence was noticed in cocoa plants of different age groups ranging from 2-18 years.

A survey of cocoa gardens in S. India during 1980 revealed the incidence of canker only in 6 gardens out of the forty gardens surveyed. (Chandra Mohanan and Kaveriappa, 1981). The present results indicate that the canker incidence has increased during the last decade with the increasing age of plantation as well as with the expansion in area under planting. Zaiger and Zentmyer (1965) reported that in British Solomon Islands Protectorate the incidence was less than one per cent in 1967 whereas it was three per cent in 1971.

The intensity of canker disease also varied depending on the cropping system. The disease incidence was the highest in cocoa-forest plantation (Table 2). In Dakshina Kannada district cocoa-forest plantations are in the Western Ghat forest region. Here, cocoa has been raised in the thick forest without removing the heavy shade. The high humidity and low temperature in these plantations due to the heavy overhead shade and high density of forest plant population may be considered as some of the factors responsible for the higher canker incidence. A perusal of available literatures indicated that there are no reports on the intensity of the disease under different cropping system.

Based on the infection at different heights of the plant, the trunk (main stem) cankers were the maximum followed by branch cankers. Out of the 90 infected trees, trunk cankers were observed in 54 trees (Table 2). Cocoa pods are mainly produced on the trunk or main stem. The higher incidence of trunk cankers indicates that the potential source of

inoculum might have come from black pod disease affected cocoa pods on the trunk. Several workers have connected canker with black pod disease. They found that the infection spread from the pod to the peduncle and then to the cushion and bark (Rorer, 1910; Briton-Jones, 1934; Thorold, 1955).

Thus to conclude, the results reveal that the canker disease of cocoa varies depending on the locality due to difference in weather factors; it varies depending on the cropping system possibly due to resultant change in predisposing factors; it also varies depending on age and height of the plant.

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TABLE 1

Incidence of cocoa canker in different localities in Dakshina Kannada District

Taluk	Locality	No. of gardens	Cropping System	No. of plants examined	No. of plants with canker			Total number of infected plants
					Early	Severity Middle	Advanced	
Buntwal	Vittal	3	Cocoa-arecanut	290	9	7	6	22
		1	Cocoa-coconut	108	1	..	1	2
	Vokkethur	2	Cocoa-arecanut	482	2	5	2	9
Puttur	Padnur	1	Cocoa-arecanut	130	1	1	..	2
Sullia	Aletty	1	Cocoa-arecanut	250	1	2	..	3
	Thodikana	2	Cocoa-forest plantation	340	14	14	12	40
	Aranthodu	2	Cocoa-coconut	260	1	1	2	4
	Kallugundi	1	Cocoa-arecanut	150	1	1	2	4
Beithangadi	Mundaji	2	Cocoa-arecanut	90	1	2	1	4
Dakshina Kannada District	8	15	..	2100	31 (34.44%)	33 (36.67%)	26 (28.89%)	90

TABLE 2

Incidence of cocoa canker in relation to cropping systems

Cropping System	Age of cocoa Plants (Yrs)	Number of plants examined	Number of Plants with canker			Total no. of infected plants	Infected plants (%)
			Collar	Trunk	Branch		
Cocoa-arecanut	10--18	1392	4	31	9	44	3.2
Cocoa-coconut	12--14	368	1	5	..	6	1.6
Cocoa-forest Plantation	2--8	340	11	18	11	40	11.8
Total	—	2100	16 (17.78%)	54 (60%)	20 (22.22%)	90	4.29