

Epidemiological Studies on Inflorescence Dieback of Arecanut caused by *Colletotrichum gloeosporioides*

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Abstract

The inflorescence dieback of areca palm occurs mainly during the months of March - May. Areca inflorescences immediately after shedding of male flowers are highly susceptible to the disease. The infection usually starts from the tip of inflorescences and spreads towards the base leading to shedding of female flowers. The scars left by the male flowers at the time of shedding and the dew water deposits during night are believed to be the favourable factors for the germination, penetration and infection by the fungus on the rachille of inflorescences. It has been observed that the areca fruits which are resistant when green become susceptible when they ripen.

*The epidemiological studies have shown that the incidence of the disease becomes higher and higher during February-March, reaches a peak during April-May and subsequently becomes insignificant during July-January. The high relative humidity (86-99%) and low temperature (18-29°C) in the early hours of the morning (2.00 hr to 8.00 hr) followed by high temperature (28-34.5°C) and low R H (30-70%) in the afternoon (12.00 hr to 16.00 hr) and the availability of inflorescences of the susceptible stage appear to favour disease development during March-May. The relationship between per cent inflorescence produced and disease incidence was found to be highly significant ($r=0.65^{**}$).*

Introduction

Areca palm (*Areca catechu* L.) is affected by a number of fungal diseases such as *Koleroga* or fruit rot caused by *Phytophthora arecae* (Coleman) Pethybridge, *anabe roga* or foot rot caused by *Ganoderma lucidum* (Leys.) Karst. and inflorescence die back caused by *Colletotrichum gloeosporioides* Penz. (stonem) spauld and schrenk (Reddy et al., 1978). Inflorescence dieback has been reported

to be wide spread in Kerala and Karnataka which are the major areca growing states in India (Saraswathy et al., 1977). Though the incidence of the disease is high during the dry weather, epidemiological factors which influence disease development and severity are not worked out in detail and hence the present studies were undertaken.

Materials and Methods

Susceptibility of inflorescence to infection

The susceptibility has been studied on inflorescences at three stages of maturity viz., (1) before shedding of male flowers; (2) after shedding of all the male flowers

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and (3) after fruit set. In the field the inflorescences at these stages of maturity were inoculated by spraying a suspension of conidia and mycelia of the fungus in sterile water and covered with polythene bags for 72 hr. They were kept under constant observation.

Disease Incidence

The incidence of inflorescence dieback on 75 palms in three replications in a cacao-areca mixed garden was recorded at monthly intervals during 1980 - '81. The per cent inflorescences produced and disease index were calculated as follows:

$$\text{Inflorescence produced (\%)} = \frac{\text{Total inflorescence produced}}{\text{Total trees observed}} \times 100$$

The severity of the disease was rated visually on a 5 point scale; 0=no infection, 1=1-25%, 2=25-50%, 3=50-75% and 4=75-100% infection based on the area of the inflorescence affected.

The disease index of each plot was calculated by following Mckinney's equation (Mckinney, 1923).

$$\text{Disease index (\%)} = \frac{\text{Sum of all numerical ratings}}{\text{Total no. of plants observed} \times \text{Maximum rating value (4)}} \times 100$$

The mean of three replications was taken as the monthly disease index.

The R H and temperature in the cacao-areca mixed garden were recorded continuously with a thermohygrograph during critical period of disease incidence.

Results and Discussion

Susceptibility of inflorescence to *C. gloeosporioides* infection

From the constant observations on the initial stage of infection of the inflorescences under natural condition, the most

susceptible stage of infection was found to be immediately after shedding of all the male flowers. The scars left after shedding of male flowers were found to be the main foci of infection. The infection spreads from the tip of the inflorescences to the base and causes the shedding of female flowers. The inflorescences were found to be partially or completely infected. The infection was rarely initiated at the basal portion of the inflorescence or through the female flowers. The green fruits were resistant in the beginning and they became susceptible only when they turned yellowish-red during ripening.

Though detailed studies were not conducted earlier on the initial foci of infection, Saraswathy et al., (1977) reported that in nature the pathogen may gain entry into the inflorescence through the scars left after the shedding of male flowers or through the stigma of the opened female flowers. The present observations also confirm the earlier finding. It is quite possible that the scars left on the rachille by the male flowers and collection of water due to dew formation in night favour the entire process of infection.

From artificial inoculation experiments, it was found that the inflorescences soon after shedding of male flowers became more easily infected than other stages. This confirms the observation that infection mostly takes place on inflorescences soon after shedding of male flowers under natural conditions.

Disease Incidence

Monthly observations on the disease incidence showed that inflorescence dieback is present throughout the year. The incidence of the disease became higher

during February - March, reached a peak during April-May and subsequently became low and insignificant during July - January (Table 1)

The R H and temperature recorded from the garden during March to May are given in Table 2. Though the mean R H during 1980-1981 was 76.13 to 82.08 per cent the highest was 99% and lowest was 45% during March-May. The highest temperature, (28°C to 34.5°C) was recorded from 12.00 hr to 16.00 hr and the lowest (18°C to 29°C) from 2.00 hr to 8.00 hr during March to May.

The maximum number of inflorescences of the susceptible stage (75-80%) was observed from January to May. In general the disease appeared to be closely related to the production of inflorescences.

The high humidity and low temperature prevailing during the months March-May in the early hours of morning followed by high temperature in the afternoon and the availability of inflorescences of susceptible stage during this period appear to favour disease development. The relationship between inflorescence produced and disease incidence was found to be highly

Table 1. Incidence of inflorescence die back of Arecanut*

Months	1980		1981	
	Inflorescence produced (%)	Disease index (%)	Inflorescence produced (%)	Disease index (%)
January	64.84 [81.93]	18.41 [9.98]	66.20 [83.71]	15.99 [7.58]
February	77.51 [95.33]	25.09 [17.98]	83.10 [98.56]	24.54 [17.25]
March	75.25 [93.52]	30.11 [25.17]	73.10 [91.55]	24.75 [17.53]
April	68.11 [86.11]	39.36 [40.22]	83.10 [98.56]	38.55 [38.84]
May	60.45 [75.67]	42.80 [46.16]	63.10 [79.53]	41.74 [44.32]
June	51.33 [60.96]	22.82 [15.05]	45.00 [50.00]	24.54 [17.25]
July	28.10 [22.19]	17.94 [9.48]	40.00 [41.32]	10.68 [3.43]
August	21.02 [12.86]	12.70 [4.84]	16.90 [8.45]	11.73 [4.13]
September	21.44 [13.36]	10.85 [3.55]	30.00 [25.00]	10.30 [3.20]
October	33.47 [30.42]	12.39 [4.60]	32.59 [29.01]	13.70 [5.61]
November	39.35 [40.19]	12.83 [4.93]	40.00 [41.32]	12.85 [4.94]
December	56.00 [68.73]	14.49 [6.26]	47.41 [54.21]	11.73 [4.13]
CD [P = 0.05]	19.42	10.28	15.83	18.10

*After arcsine transformation

Figures in parenthesis are the retransformed mean values.

significant ($r=0.65^{**}$). The regression equation to determine the disease index from per cent inflorescence produced is $y=1.625+0.305x^{**}$.

During the south-west monsoon period (June-September) the inflorescences were very rarely produced and hence the disease

incidence in the garden was also very low.

Thus the abundance of inflorescence of susceptible stage and the prevailing climatic conditions during April-May are the favourable factors in the epidemiology of the inflorescence dieback of arecanut in this region.

Table 2. Temperature and RH in cacao - areca mixed garden during the peak incidence of inflorescence die back

Month	TEMPERATURE °C				RELATIVE HUMIDITY	
	Minimum		Maximum		Mean	Range
	Mean	Range	Mean	Range		
1980						
March	21.96	18.0 - 24.0	32.00	30.5 - 34.5	80.50	50-99
April	22.30	19.0 - 25.0	32.87	28.9 - 34.5	82.08	64-98
May	24.88	22.0 - 27.5	35.68	29.5 - 33.5	79.88	59-99
1981						
March	21.26	18.0 - 23.0	31.85	30.0 - 33.5	76.13	20-96
April	23.97	22.5 - 25.5	33.50	31.5 - 36.0	81.06	50-99
May	25.18	24.0 - 27.0	37.86	35.0 - 42.0	78.70	45-97

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