

PHYSICAL FACTORS THAT INFLUENCE GROWTH AND SPREAD OF LEAF BLIGHT PATHOGEN (*PESTALOTIA PALMARUM*) INFECTING COCONUT PALM

BY

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Key words : Physical factors, Growth, Spread, *Pestalotia palmarum*, Coconut Palm

Leaf blight or grey leaf spot caused by *Pestalotia palmarum* is a major disease of coconut palm under Indian condition. The present study has shown that the disease is favoured by low atmospheric temperature (30 to 31^o.5^oC), high relative humidity (80 to 90%) and high rainfall (896.1 mm) during the monsoon period. *In vitro* study also indicates that the growth and germination of the pathogen are influenced by low temperature (30^oC) and high relative humidity (90 to 100%).

INTRODUCTION

Leaf blight or grey leaf spot caused by *Pestalotia palmarum* Cooke is a major disease of coconut palm (*Cocos nucifera* L.) as it is widely prevalent over most of the coconut growing states of India, being particularly severe in Kerala (Menon and Pandalai, 1958; Bose, 1985; Mulyar *et al.*, 1986). The disease has gained its importance in West Bengal during the recent years (Dutta Ray *et al.*, 1987). The disease occurs during the *kharif* season (summer/monsoon) at any stage of plant growth, and it is characterized by the formation of greyish-white spots, surrounded by a brown band. In case of severe infection, hundreds of spots may be found on a leaf blade, causing blight and withering of the leaf (Child, 1964). Adverse cultural practices, poor soil condition and potash deficiency seem to favour the incidence of this disease (Jones, 1940).

Although leaf blight of coconut palm occurs every year in various parts of India including West Bengal, the role of weather factors on disease severity is less clear.

MATERIALS AND METHODS

The study was undertaken during the months from July to September (*kharif* season) of 1984, 1985 and 1986 at the Coconut Research Station, BCKV, West Bengal

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A susceptible cultivar Malayan Dwarf Yellow (MDY) was included in the experiment. The seedlings were planted in May-June of the year 1980 following the square system of planting. Each square consisting of 4 plants was replicated thrice to represent a single replication, and 3 such replications were kept. Normal agronomic practices were followed and no plant protection measure was undertaken. Donor plants out of a local cultivar were established about 2 years back surrounding the experimental plots to provide source of inoculum of the pathogen (*P. palmarum*) to the acceptor genotype under the experiment. The incidence of the disease was recorded after the rainy season of each year on the basis of 1 (very slight to slight infection) to 5 (very heavy infection) scale as described elsewhere in details (Dutta Ray et al., 1987).

Temperature effect on mycelial growth (mm) of the pathogen was studied on Potato Dextrose Agar (PDA) medium using 10 cm sterilized petriplates replicated times. Mycelial growth out of a 6 mm disc placed at the centre of the plate was measured after 7 days. Such plates maintained at various temperatures (22° to 38°C) revealed the ideal requirements for faster growth.

Conidial germination at various temperatures (22° to 38°C) was studied in double-grooved cavity slides. The slides with a drop of conidial suspension on sterile tap water placed in each of the grooves, were rested on two glass rods within humidity chambers prepared by placing moistened filter papers at the bottom of the 10 cm petriplates. The cavity slides were then maintained at different temperatures and the percentage of conidial germination was recorded after 16 hours.

Effect of relative humidity (RH) on the mycelial growth was studied by maintaining different humidities within 20 cm sterilized petriplates at a constant temperature of 30°C by adding 20 ml solutions of different concentrations of sulphuric acid (McLean and Cook, 1965). 10 cm sterilized petriplates containing sterilized PDA medium were inoculated with fungal cultures similarly as described before. The inoculated petriplates replicated 5 times were aseptically placed by removing the upper lids in different humidity chambers. These plates were then incubated at 30°C and the mycelial growth was measured after 7 days. On the same pattern following McLean and Cook (1965) various levels of RH were generated to observe conidial germination in double grooved cavity slides.

Daily weather parameters such as average maximum and minimum temperature (°C), RH (%) and total monthly rainfall (mm) of 1984 to 1986 were recorded from July to September (Table 1).

The data on the disease incidence of different years were statistically analysed to find out the critical difference at 5% level ($P=0.05$) by Duncan's multiple range test, and were affixed with different letters (a, b, c,). Data which did not share the common letters were significantly different. Regression analysis was

done only to quantify the role of physical parameters (temperatures and RHs) on the pathogen spread.

RESULTS AND DISCUSSION

Data on the incidence of leaf blight (*P. palmarum*) of coconut palm in different years are presented in Table 2. It is evident that the disease incidence was significantly higher in 1986 in comparison to 1984 and 1985. Maximum and minimum disease index were also recorded to be highest in 1986.

Effects of temperature and RH on the growth and conidial germination of *P. palmarum* are presented in Table 3. Maximum mycelial growth and conidial germination were recorded at 30°C, while below and above this level both mycelial growth and conidial germination gradually tended to decrease. Although a good growth and conidial germination were recorded within the range of 70 to 100% of RH the optimum level in such cases was 90 to 100%. Below 90% RH both growth of the colony and conidial germination slowly decreased.

Table 1. Meteorological data during the monsoon period of different years*

Months	1984			1985			1986		
	Tempera- ture (°C)	Relative humidity (%)	Rain- fall (mm)	Tempera- ture (°C)	Relative humidity (%)	Rain- fall (mm)	Tempera- ture (°C)	Relative humidity (%)	Rain- fall (mm)
July									
Max	33.0	90.2	161.8	31.4	70.0	192.0	31.5	88.0	241.9
Min	29.2	69.1		22.6	56.0		25.2	72.8	
August									
Max	33.2	91.2	368.8	32.2	73.3	214.0	32.2	88.0	97.6
Min	26.5	69.2		26.5	58.7		25.6	64.7	
September									
Max	33.8	83.9	188.2	32.0	70.0	141.0	30.0	90.0	556.6
Min	25.6	49.4		22.4	53.2		23.2	68.5	

*Meteorological data were recorded from the Plant Virus Research Centre of the Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya.

Table 2. Incidence of *Pestalotia palmarum* on coconut palm in different years

Year	Disease index		
	Maximum	Minimum	Average*
1984	4.0	3.0	3.8 b
1985	3.5	2.5	3.2 c
1986	4.5	4.0	4.4 a

*Data not sharing the common letters are significantly different ($P=0.05$) as determined by Duncan's range test.

Table 3. *In vitro* effect of temperature and relative humidity on the linear growth and conidial germination of *Pestalotia palmarum*

Temperature (°C) (X ₁)	Linear growth (mm)(Y)		Conidial germination (%) (Y ₂)		% Relative humidity (X ₂)	Linear growth (mm) (Y ₃)		Conidial germination (%) (Y ₄)	
	Origin-value	Regression value	Origin-value	Regression value		Origin-value	Regression value	Origin-value	Regression value
22	45.0	38.1	85.0	45.5	60	65.0	70.6	72.0	73.0
26	55.0	51.0	92.0	60.6	70	69.0	72.6	85.0	75.1
30	64.0	65.8	95.0	78.0	80	72.0	74.6	92.0	76.2
34	28.0	74.0	72.0	87.6	90	76.0	76.6	95.0	79.3
38	15.0	93.2	31.0	118.4	100	76.0	78.6	95.0	81.4

$$Y_1 = 1.35 + 0.35 X_1 + 0.06 X_1^2$$

$$Y_2 = 2.40 + 0.42 X_1 + 0.07 X_1^2$$

$$Y_3 = 58.60 + 0.20 X_2$$

$$Y_4 = 64.40 + 0.21 X_2$$

The *in vitro* studies indicate that the growth and germination of the pathogen are influenced by cool temperature and high RH. Menon and Pandali (1959) and Muliya *et al.* (1986) have reported that some diseases of coconut palm including leaf blight are favoured by high rainfall, low atmospheric temperature and high RH during the monsoon period particularly in the Southern States and coastal region of India. Dutta Ray *et al.* (1987) in a preliminary study also recorded high incidence of this disease during the monsoon months when atmospheric temperature became low and RH was high. Therefore, the existing weather conditions in respect of comparatively less atmospheric temperature (max 30 to 31.5°C and min 23.2° to 25.6°C), high relative humidity (max 80 to 90% and min 64.7 to 72.8%) and highest amount of rainfall (total 896.1 mm) might have favoured the highest incidence of this disease in 1986. The present study, therefore, clearly indicates that the incidence of leaf blight of coconut palm is influenced by low temperature (30 to 31.5°C) and high relative humidity (90 to 100%).

ACKNOWLEDGEMENT

The authors record their thanks to Prof. T. K. Bose, Department of Horticulture and Prof. P. K. Sengupta, Department of Plant Pathology for their interests.

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(Accepted for publication July 20 1988)