Epidemiology of Bacterial Leaf Stripe Disease of Arecanut palm (*Areca catechu* L.) caused by *Xanthomonas campestris* pv *arecae*

II. INFLUENCE OF MANAGEMENT PRACTICES ON THE DISEASE INCIDENCE

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Abstract

Bacterial leaf stripe of arecanut caused by X. campestris pv. arecae is a serious disease found affecting arecanut palms in the inland plains of Karnataka. For ensuring infection by the pathogen temperature, humidity and nutrients seem to have an important role. Certain specific cultural practices adopted in plantations were also found to be congenial for disease development and spread. Frequent irrigations (once in 5 to 10 days interval) was found to aggravate the disease. Higher levels of nitrogen and green matter were found to favour disease development. Phosphorus and potash did not seem to have any influence. Intercropping with banana was found to enhance disease intensity.

Introduction

Bacterial leaf stripe of arecanut (*Areca catechu* L.) caused by *Xanthomonas campestris* pv *arecae* is a serious malady prevalent in the *Maidan* parts of Karnataka state. The disease causes heavy loss to the crop in this area. Environmental factors like temperature, humidity etc., which govern the incidence of epiphytotics have been studied earlier (Sampath Kumar, 1981). The agronomic practices recommended may alter directly or indirectly the micro-climate affecting the pathogen and the host. In the present studies, certain specific practices that favoured disease incidence are reported.

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Materials and Methods

These investigations were conducted during 1974-'76 at the Central Plantation Crops Research Institute, Research Centre, Hirehalli, Tumkur District, Karnataka State in the existing agronomic field layouts. The soil is clayey to clayey loam with a pH 6.8. The recommended agronomic practices were adopted in all experiments unless otherwise stated.

Effect of irrigation on disease incidence

This main field experiment was to find out the optimum depth of planting and suitable intervals of irrigation to be adopted. The irrigation done during summer months involved four treatments.

The experiment was laid out in a 4×3×5 split plot design with four levels of irrigation based on cumulative pan evaporimeter readings as detailed below:

30mm when CPE = 30mm irrigation (I_1)
30mm when CPE = 60mm irrigation (I_2)
60mm when CPE = 60mm irrigation (I_3)
60mm when CPE = 120mm irrigation (I_4)

Effect of fertilization

The layout of this experiment was on a 3^4 factorial confounded design with nine plot blocks with a single replication to find out the optimum levels of NPK and green leaf (G) to be given to arecanut palms. The effect of fertilization on disease incidence and severity were recorded during the years 1974 - '76. The different levels of NPKG applied are as follows:

	Levels (in gm palm/yr)		
	0	1	2
Nitrogen (N) in the form of Am. Sulphate	0	100	200
Phosphorus (P) in the form of Superphosphate	0	40	80
Potash (K) in the form of Muriate of potash	0	140	280
Green leaf (G) in the form of Glyricidia/Pongamia	0	12kg	24kg

Effect of Intercropping

The different intercrops comprising banana, tapioca, pineapple and betelvine were planted and cultural practices were adopted as per the recommended package of practices. This experiment was laid out on a randomised block design with four replications.

Method of scoring disease severity

Disease incidence was measured as the number of palms affected in different field layouts. Individual leaflets were rated for the disease intensity. The data gathered represented the proportion of leaflets infected in a frond and the number of palms affected by the disease in each of the field experiments. The data obtained were analysed using appropriate statistical methods.

Results

Effect of irrigation on disease incidence

Data showed that frequent irrigation at shorter intervals encouraged disease development and spread. Palms receiving irrigation once in five days (30mm CPE) showed higher percentage of incidence and spread (Table 1) as compared to other intervals studied. Though the intervals of irrigation was significant, between years there was no significance.

Table 1. Effect of Intervals of Irrigation on the percentage of disease incidence due to *Xanthomonas campestris* pv *arecae*.

Year	5 days	10 days	15 days	20 days
1974	13.5	8.6	10.7	6.4
1975	20.6	12.0	7.0	7.4
1976	15.0	10.0	8.0	7.0

S. E. 2.21
C. D. for Int. of Irrigation 4.41

Effect of fertilization on disease incidence

Palms receiving higher dose of nitrogenous fertilizers and green leaf showed higher percentage of disease as compared to palms not receiving any nitrogen or green manure. Phosphorus and potash had no significant influence except for slight reduction of disease incidence at higher levels (Table 2). The difference between treatments and their interaction has been found to be significant.

Effect of intercropping

The effect of intercropping and the change in environment as a result of intercropping and response of intercrops on the disease status revealed that, plots intercropped with banana had higher percentage of disease incidence than other intercrops tested (Table 3). Betelvine showed next higher incidence, whereas, tapioca and pineapple did not have much influence on the disease status. Though there is significance between intercrops, between years there was no significance.

Discussion

Changes in land use patterns and management practices influence disease incidence in every crop either positively or negatively. This has to be understood clearly so that sustained disease free crop could be raised. Among the physical environmental factors, moisture is essential for plant growth and development of disease causing agents. Soil moisture in the form of irrigation and rain could influence the host and the pathogen. The variation in soil moisture and humidity play an important role in the development and conversely the control of soil borne and aerial pathogens (Zentmyer and Bald, 1978). Alternate drying and irrigation could cause disease build up in bacterial blight of rice due to *X. campestris* pv *oryzae* (Dath and Padmanabhan, 1976). Several diseases are controlled by maintaining a flooded soil for varying periods of time(Newhall,1955).

Table 2. Effect of different levels of fertilizers on disease incidence (%) due to *Xanthomonas campestris* pv *arecae*.

LEVELS	1974			1975			1976		
	0	1	2	0	1	2	0	1	2
Nitrogen (N)	16.0	26.0	35.5	15.0	25.0	34.0	20.0	26.6	36.0
Phosphorus (P)	20.0	19.0	20.0	24.0	29.0	26.3	30.0	23.0	23.0
Potash (K)	30.0	22.0	22.0	29.6	24.0	25.0	26.0	23.0	23.0
Green leaf (G)	23.0	32.0	34.0	20.0	30.0	30.0	23.0	33.0	26.0
Control	18.0	21.0	18.0	16.0	20.0	20.0	18.0	20.0	19.0

SE for Main treatments 1.717
SE for sub - treatments 0.7658

Table 3. Effect of intercropping on the disease incidence (%) due to *Xanthomonas campestris* pv *arecae*.

Crop	1974	1975	1976	Mean
Betelvine	6.50	5.50	5.75	5.92
Banana	7.75	8.00	8.00	7.92
Tapioca	5.00	3.50	4.00	4.17
Pineapple	5.25	3.75	4.25	4.42
Control	6.00	4.25	3.75	4.67

CD (P=0.05) for intercrops 1.63

Changes in host nutrition cannot be explained clearly as it is a complex one. The increase in disease incidence at higher levels of N and G in bacterial leaf stripe disease may be due to good growth which is favourable for dissemination of the pathogen there by influenceing disease incidence under field conditions. Also, increased supply of N can increase the innate susceptibility of plants (Segall et al., 1977). Different levels of N and unsuitable combinations of N, P and K and their influence on bacterial diseases has been extensively reviewed (Yamanaka et al., 1952; Kondo and Kamura, 1953; Suliman and Ahmed, 1965; Ten Have and Kauffman, 1972; Bartz et al., 1979).

The philosophy of intercropping or multiple cropping is maximum crop per unit area and time with least soil deterioration. This practice helps to tide over the risk of poor yields from main crop due to unfavourable weather conditions, ravages of pest and disease. As a result of intercropping the environment within the plantation is considerably altered which indirectly influences the soil moisture relations. Moreso, it reduces radiation from the foliage and soil, temperature difference between air and soil. The higher incidence of disease in plots intercropped with banana may be due to one of these factors or a combination of these factors.

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