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Comparative abundance of the Tingid vector *Stephanitis typica* (Distant) in root (wilt) disease affected and healthy coconut palms in Kerala

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Abstract

Direct and indirect evidences are available on the role o *Stephanitis typica* (Distant) (Heteroptera: Tingidae) as vector of Coconut Root (wilt) disease in Kerala. The indirect evidence is supported in this paper by a study on comparative abundance of the lace bug on diseased and disease-free coconut palms at different localities. Analysis of pooled data on the population of the tingid on palms in the three borders demarcating the disease-prevalent and disease-free zones in the northern, southern and eastern coconut gardens in the State has brought out significant increase in the numbers of the insect on palms under different intensities of the disease (apparently healthy, early disease and advanced disease) as compared to those on healthy palms. Count of the vector on seedlings also gave two to four times increase in population in diseased condition over the healthy.

Introduction

Stephanitis typica (Distant) (Heteroptera: Tingidae) was reported transmitting Coconut Root (wilt) disease by Nagaraj & Menon[7] and Shanta *et al.* [8, 9]. The vector role of the lace bug was further brought out through studies on secondary host by Joseph *et al* [4]. Indirect evidence on the role of the tingid in the transmission of the disease was presented by Shanta *et al* [8] through their observation that *S. typica* formed the single major group of insect visitors on coconut palm, and by Shanta *et al* [10] through their report on a lower rate of spread of the disease on under-planted seedlings sprayed fortnightly with DDT to ward off the insect vector than in the unsprayed ones. Preliminary studies by Shanta *et al* [8] showed a ratio of 1:1.5 for the population of the lace bug in healthy and diseased palms at Kayangulam, a heavily diseased area. The present study embodies results of an elaborate study on the comparative adundance of vector population in different localities in relation to the diseased or disease-free condition of the palms.

Materials and Methods

Coconut palms in the Amballur-Varandarapally tract, Nemam-Neyyatinkara -Neyyar borders and Aryancavu representing, respectively, the northern, southern and eastern borders demarcating the disease-prevalent and disease-free areas in Kerala State[2] as well as in Kayangulam, a very heavily diseased pocket and Kasaragod, a disease-free zone formed the material for study. Palms at the borders were classified into apparently healthy (symptomless), early disease and advanced disease categories. The palms were located in different gardens of low incidence at the boundary belts, but care was taken to include equal number of palms in each category from the same garden. A set of healthy palms were selected ten or more kilometers away from each border towards the disease-free zone. Similarly sets of palms belonging to apparently healthy, early disease and advanced disease categories at Kayangulam and a set of healthy palms at Kasaragod were also selected. Count of the lace bug present on ten palms of each category at the time of observation during the two peak periods of its abundance in the field in March-April-May and September (Mathen *et al* [5]) were recorded individually on the selected palms from 1972 to 1974 according to the method evolved by Mathen *et al* [6]. In order to take care of the annual variation in population, the months of observation on population at the borders were distributed as given below:

	March	*April*	*May*
1972 ..	North	South	East
1973 ..	South	East	North
1974 ..	East	North	South

In September 1972 and 1973, the population was recorded at all centres. Total Counts of lace bugs in clusters of ten palms for the five sets of observations (replications) were compiled for the different categories and compared statistically by the Analysis of Variance (ANOVA) Technique.

Results

Consolidated data (total) of the sample population in the different categories of palms are presented in Table 1.

Table 1. Total count of sample population of *S. typica* in groups of ten coconut palms under different categories at different localities.

Locality		Category			
		Apparently healthy (symptomless)	Early disease	Advanced disease	Healthy
Border	North	806 (1.95)	883 (2.13)	923 (1.99)	414
	South	577 (1.57)	604 (1.64)	493 (1.34)	368
	East	476 (less)	582 (1.04)	528 (less)	558
Diseased tract					
	Kayangulam	673 (1.62)	604 (1.44)	566 (1.37)	Category not available
Disease-free area					
	Kasaragod	Category not available		———	414

(figures in parenthesis indicate the ratio of the number of insects present in the respective category to the number recorded on healthy palms)

Mean (categories)		Mean (location)		
Apparently healthy	633*	North	..	731.5*
Early Disease	668.25*	South	..	510.5
Advanced disease	602.5*	East	..	536.0
Healthy	438.5	Kayangulam	..	564.25
CD 5 Per cent	154.54	CD 5 Per cent		159.54

*Significant at P = 0.05

It is seen that the increase in the population of the vector in apparently healthy, early disease and advanced disease categories over the healthy varying from 34 to 113 per cent except at the eastern border is significant for total values. Between the different categories of disease, there was no significant difference. Similarly, the population recorded from the northern border is significantly higher than at other centres.

periods of sampling has, however, not been taken care of in this.

Count of the lace bugs on eight four-year-old West Coast Tall coconut seedlings planted in a diseased tract in 1972 in various cultivators' gardens within a maximum distance of 30 km from the research institute and had become diseased in 1976 was compared with the count on eight seedlings which had not

Table 2. Number of *S. typica* on coconut seedlings before and after the onset of disease.

	Adults	*Nymphs*	*Total*
Healthy seedlings (1975)	42	156	198
Same seedlings diseased ('76)	119	296	415
Increase over healthy	x 2.6	x 1.9	x 2.1

A similar comparison of the total count of the lace bug on 35 seedlings planted in 1972 at the farm of the research institute, not exhibiting symptom of the disease till 1975 but had contracted the disease in 1976 also showed that the number was greater in the diseased seedlings as given in Table 2. The variations in abundance influenced by different

taken up the disease, selecting one pair of diseased and healthy seedlings from the same garden. Lace bugs present on all leaflets of all the leaves were counted. The number which occurred on the diseased seedlings was about four times the number registered on the healthy both at nymphal and imago stages (Table 3).

Table 3. Number of *S. typica* recorded simultaneously on diseased and disease-free coconut seedlings

	Adults	*Nymphs*	*Total*
Healthy seedlings	49	30	79
Diseased seedlings	189	108	297
Increase over healthy	x 3.9	x 3.6	x 3.8

Discussion

Vast majority of the reported cases of transmission of plant diseases by insect vectors is by Homoptera, mostly aphids and leafhoppers. Two instances of Heteroptera, both belonging to Piesmatidae, allied to Tingidae, viz., *Piesma quadrata* Fieb., tansmitting sugar beet leaf curl[11] and *P. cinerea* (Say) transmitting beet savoy disease[1] lend support to the role of *S. typica* as vector of Coconut Root (wilt) disease reported on the basis of experimental results. The conclusion from the present study of a higher abundance of the insect on diseased palms and seedlings than in the disease-free ones add to the indirect evidence on its role in spreading the disease in the field. Nevertheless, it in not known for certain whether the higher numbers render the palms diseased or whether the altered metabolism of the the palm as a result of the disease attracts more insects to them. This can perhaps be satisfactorily answered after a detailed probe in to the nutritional requirements or habits of the insect and a comparison of population of the insect on palms/seedlings before the onset of the disease with the population on palms / seedlings not rendered diseased under identical conditions. However, in the light of the report by Joseph *et al*[4] that only 16% of the field population is infective, the possibility is that higher the population, greater the chances of disease incidence. Shanta *et al*[8] based on preliminary observations, remarked that palms which were highly infested by *S. typica* became diseased earlier. The report by Howard[3] that population density of *Myndus crudus* Van Duzee was several times higher in Lethal Yellowing infected coconut palms in the east coast of Florida than in disease-free areas is very significant in the context.

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