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A technique to estimate the field population of the lace-bug, *Stephanitis typicus* Distant (Heteroptera: Tingidae), a pest of coconut palm in Kerala

K. MATHEN[1], M. V. GEORGE[2] and CHANDY KURIAN[3]

Regional Station, Central Plantation Crops Research Institute, Kayangulam

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ABSTRACT

The total population of *Stephanitis typicus* Distant, a pest of coconut foliage, could be projected from the sample population obtained by counting the total number of pests present on 20% leaflets at the middle region of 20% leaves. The innermost leaves were taken for sample in each palm. The sample population multiplied by a constant (3·76) gave the estimated population within 5% error on groups of palms, the number in each group being not less than 10.

Corbett (1932), Nirula (1955) and Mathen (1960) reported *Stephanitis typicus* Distant as a pest of coconut foliage. Shanta *et al.* (1964) confirmed the report of Nagaraj and Menon (1956) that it acts as a vector of the pathogen, probably a sap-transmissible virus associated with the coconut root (wilt) disease. Summanwar *et al.* (1969) detected rod-shaped virus particles in the tissues of diseased palms. A comparison of the population of the insect in the healthy and diseased palms was therefore considered desirable to determine

[1]Junior Virus Entomologist, [2]Senior Statisitcal Assistant, [3] Entomologist.

Table 1. Selection of sample leaves in the score group 81–100 in trees of varying total number of leaves

Total number of leaves	Position of leaf (Score)														
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
25	84	88	92	96	100										
26	81	85	88	92	96	100									
27		81	85	89	93	96	100								
28			82	86	89	93	97	100							
29				83	86	90	93	97	100						
30					83	87	90	93	97	100					
31					81	84	87	90	94	97	100				
32						81	84	88	91	94	97	100			
33							82	85	88	91	94	97	100		
34								82	85	88	91	94	97	100	
35									83	86	89	91	94	97	100

its role in the natural spread of the disease in the field. There is, however, no standardized method to estimate the field population of the pest. Attempts were made to evolve a sampling technique, the results of which are reported in this paper.

MATERIALS AND METHODS

The material was obtained from the absolute population of the pest recorded in 1960–62 at this research farm on 80 young palms by the direct-counting method. Details on the total number of leaves, number of attacked leaves, position of the attacked leaves, total number of leaflets for each attacked leaf, number of attacked leaflets in each leaf, position of the attacked leaflet and the number of pests present (adults, nymphs and their total) on each attacked leaflet were recorded at monthly intervals for individual palms during the period of study.

As a great variation exists in the number of leaves per palm and the number of leaflets in a leaf, the determination of the sample size of leaves and leaflets in a particular tree becomes difficult. Hence a system of allotting scores to the leaves and leaflets was evolved to make good the natural variation in the number of leaves and leaflets in individual trees. The leaves were serially numbered inward from below the crown and the leaflets distally from base of leaf, and the score of a particular leaf or leaflet was compiled by the formula : 100 × position of leaf or leaflet as indicated by its serial number ÷ total number of leaves in the tree or leaflets in the leaf. Depending upon the total number of leaves in a particular tree or leaflets in a leaf, the number in a specified score group varies. But there is no ambiguity in the location of the sample leaves or leaflets within a specified score group. Mathen *et al.* (1969) reported that the leaves in the score group 81–100 accounted for 70% of the total pests and that 38% of the pests in the leaf were lodged in the leaflets in the score group 41–60. This was utilized for the evolution of a sampling technique to estimate the total population within 5% error.

RESULTS AND DISCUSSION

Compilation of the recorded population of the insect with various combinations of sampled leaves and leaflets for different

Table 2. Selection of sample leaflets within score groups 41–60 in sample leaves having different number of leaflets

Total number of leaflets in the leaf (1 side)	Position of leaflets with score 41–60	Total number of sample leaflets (2 sides)
110	55–66	24
111	56–67	24
112	56–67	24
113	57–68	24
114	57–68	24
115	58–69	24
116	58–69	24
117	59–70	24
118	59–70	24
119	60–71	24
120	60–72	26
121	61–73	26
122	61–73	26
123	62–74	26
124	62–74	26
125	63–75	26
126	63–76	28
127	64–77	28
128	64–77	28
129	65–78	28
130	65–78	28

sample size of trees showed that the percentage of pests accounted by leaves or leaflets of different score groups was fairly steady in the samples of 5 or more trees. For a group of 10 or more palms, sampling 20% leaflets on 20% leaves with the thickest density of population gave sufficiently accurate estimate of the total number of pests present. Thus the total pest population in a sample group of j trees was estimated by the formula:

$$T = K \sum_{i=1}^{j} Pi \pm 5\%$$

where T is the total population of the pest for the group of trees sampled, K is the constant multiplication factor, viz. 3·76, j=10 and Pi is the sample population of individual sample palm obtained by counting the number of pests present on sample leaflets with the score 41–60 (Table 2) on sample leaves having the score 81–100 (Table 1). The sum of sample population of 10 palms multiplied by the inflation factor (3·76) gave the total population, within 5% error. The variation between population estimated by the above method and the actual population recorded by complete count for 12 groups of 10 palms each ranged from 0·11 to 4·3% (Table 3). The pests could be counted *in situ*. The observations on

Table 3. Comparison of estimated and actual (recorded) population of *Stephanitis typicus* Distant on coconut palms

Group of 10 palms	Sample population	Estimated population	Actual population	Variation of estimate	
				Number	%
1	1,766	6,640	6,772	−132	−1·95
2	1,630	6,129	6,379	−250	−3·92
3	1,205	4,531	4,536	− 5	−0·11
4	1,149	4,320	4,229	+ 91	+2·15
5	1,344	5,053	5,283	−230	−4·35
6	1,642	6,174	6,214	− 40	−0·64
7	1,476	5,550	5,528	+ 22	+0·40
8	1,185	4,456	4,467	− 11	−0·25
9	1,080	4,061	4,048	+ 13	+0·32
10	1,189	4,471	4,362	+109	+2·50
11	1,221	4,591	4,574	+ 17	+0·37
12	1,160	4,361	4,308	+ 53	+1·23
Mean	1,337	5,028	5,058		
SD	231·8	871·5	948·7		
CV	17·3	17·3	18·8		

one palm occupied quarter to half an hour.

The formula has practical utility since it helps in the comparison of the total population of the pest (*i*) in healthy and diseased palms, (*ii*) in different varieties of coconut, and (*iii*) before and after insecticidal treatment.

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