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Influence of abiotic factors on population build up of cardamom whitefly *Kanakarajiella cardamomi* (David and Subramaniam) on cardamom (*Elettaria cardamomum* Maton)

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Abstract

The seasonal occurrence and influence of abiotic factors on population build up of cardamom whitefly *Kanakarajiella cardamomi* on cardamom (*Elettaria cardamomum*) was assessed during 1989-1990 at Lower Pulneys in Tamil Nadu (India). *K. cardamomi* persisted throughout the year with a maximum egg population of 9.09 per leaf during October 1989 and a minimum of 0.33 per leaf during June and August 1990; maximum nymphal population was 8.66 per leaf during October 1989 and minimum was 0.49 per leaf during August 1990. Maximum temperature and relative humidity exhibited a significant negative association with population build up of eggs and nymphs; however, none of the abiotic factors had signifiant partial correlation coefficient with egg and nymphal population. From the multiple regression equation constructed with R^2 value, it was attributed that the abiotic components had only 24 and 43% influence on the population build up of *K. cardamomi* eggs and nymphs, respectively.

Key words : cardamom, cardamom whitefly, *Elettaria cardamomum*, *Kanakarajiella cardamomi*, population.

Among the various species of insects and mites reported on cardamom (*Elettaria cardamomom* Maton, Zingiberaceae), the whitefly *Kanakarajiella* (= *Dialeurodes*) *cardamomi* (David and Subramaniam) is a major pest in certain areas in Idukki District in Kerala and in Lower Pulney areas in Tamil Nadu. In view of the serious outbreak of *K. cardamomi* in these areas, the influence of abiotic factors on the population fluctuation of this insect in the cardamom ecosystem was studied.

The study was carried out at the farm of the Indian Cardamom Research Insti-

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tute, Regional Research Station, Thadiyankudisai (Tamil Nadu) from 12.10.1989 to 12.10.1991. Twenty five clumps of cultivar type 'Malabar' were marked and maintained free from insecticidal sprays to enable a natural population build up of *K. cardamomi*. The number of eggs and nymphs in a area of 1 cm^2, at 10 sites was recorded using a 10 x magnifying glass at fortnightly intervals in each of the third, fifth and seventh leaf of an infested tiller of the marked clumps during the study period. The abiotic factors, maximum temperature, minimum temperature, relative humidity and total rainfall were recorded daily and mean values between each of the population observations were taken into consideration for analysis. The data thus obtained were subjected to statistical analysis involving the abiotic factors as independent variables and egg and nymphal population of *K. cardamomi* as dependent variables for simple correlation, simple linear regression, partial correlation and multiple regression analysis.

Populations of *K. cardamomi* persisted throughout the year with a maximum number of eggs of 9.09 per leaf during 22nd standard fortnight of 1989 followed by 6.20 during 23rd standard fortnight of 1989 and a minimum of 0.33 during 13th and 17th standard fortnight of 1990. The maximum nymphal population of 8.66 per leaf was observed during 21st standard fortnight of 1989 followed by 6.60 during 24th standard fortnight of 1989 and a minimum of 0.49 during 16th standard fortnight of 1990 (Fig. 1). It was also observed that maximum temperature and relative humidity exhibited a significant negative association with population build up of eggs and nymphs, whereas minimum temperature and total rainfall exhibited a non significant negative and positive association with egg and nymphal population, respectively (Table 1). However, none of the abiotic factors had significant partial correlation coefficient with egg and nymphal population (Table 1). It was attributed from the R^2 value constructed from the multiple

Table 1. Correlation between population of *Kanakarajiella cardamomi* with abiotic factors

Stage	Temperature		Relative humidity	Rainfall
	Maximum	Minimum		
Egg	Y=6.942-0.173x**	Y=4.408-0.119x	Y=5.880-0.041x**	Y=2.580+0.001x
	r=-0.437	r=-0.190	r=-0.364	r=0.044
Nymph	Y=7.623-0.206x**	Y=4.208-0.114x	Y=6.098-0.045x**	Y=2.424+0.022x
	r=-0.519	r=-0.181	r=-0.410	r=0.067
	Partial correlation coefficient			
Egg	-0.5477	-0.0111	-0.5240	0.2750
Nymph	-0.2660	-0.0698	-0.0701	0.3261
	Multiple regression equation			
Egg	$Y=1.588 - 0.101 (x_1) + 0.011 (x_2) - 0.030 (x_3) - 0.012 (x_4)$			
	R^2 = 23.98**			
Nymph	$Y=9.451 - 0.238 (x_1) + 0.059 (x_2) - 0.034 (x_3) - 0.016 (x_4)$			
	R^2 = 43.34**			

** Significant at 0.01%

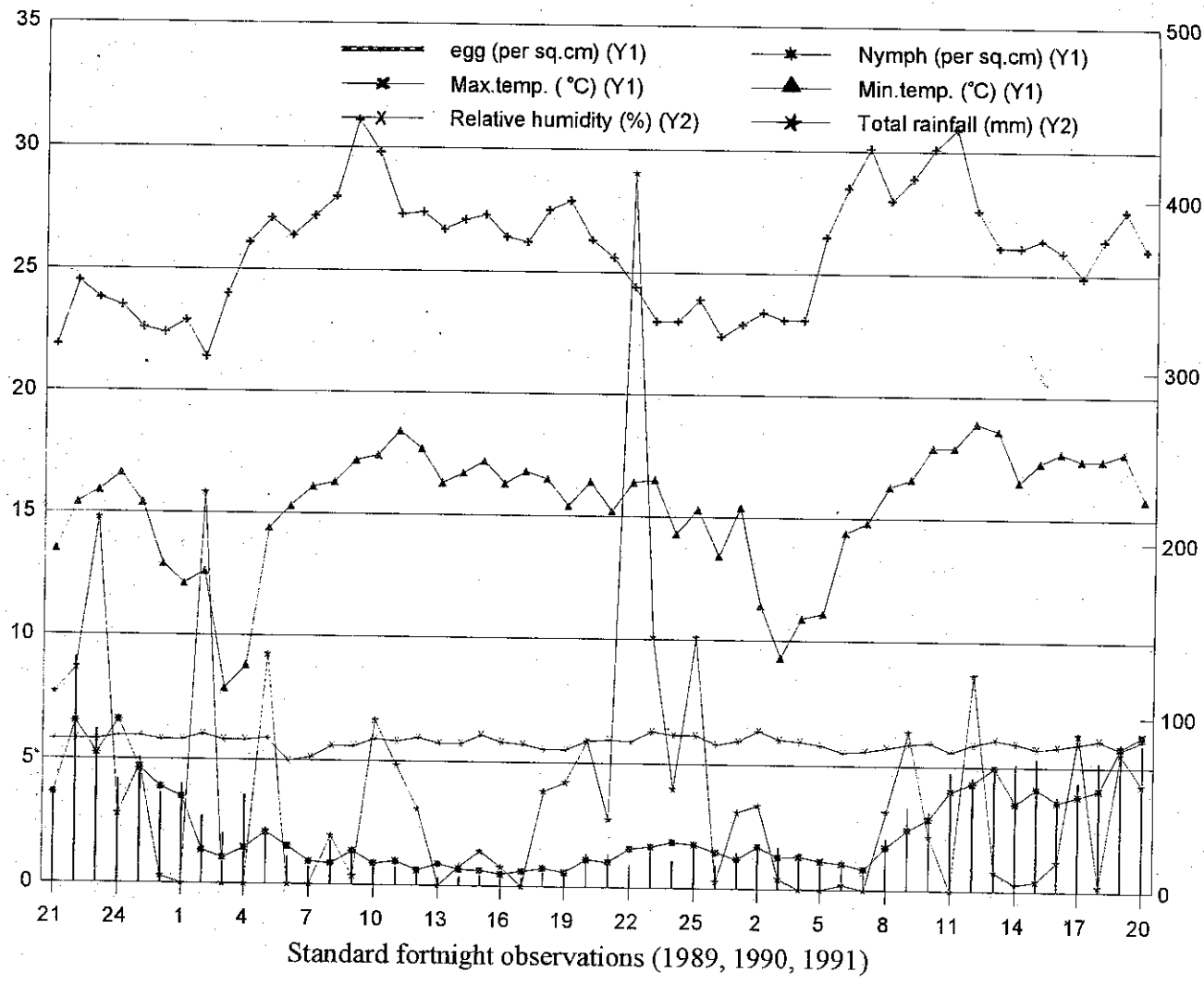

Fig. 1. Population fluctuation of *Kanakarajiella cardamomi* in relation to abiotic factors

regression equation that the abiotic components had only 24 and 43% influence on egg and nymphal population fluctuation, respectively.

The significant negative association of maximum temperature and relative humidity with egg and nymphal population of *K. cardamomi* observed in the present findings differ from the earlier reports of David *et al.* (1973) on *Trialeurodes ricini* (Misra) on castor and Lal (1981) on *B. tabaci* (Genn.) on cassava. According to David *et al.* (1973) the increase in population of various stages of *T. ricini* expressed a significant positive association with maximum temperature and Lal (1981) observed that stable maximum temperature, high rainfall and high relative humidity favoured the population build up of *B. tabaci* on cassava. Several workers namely, Hussian & Trehan (1940), Trehan (1944), Murugesan & Chelliah (1978), Butler *et al.* (1983), Pimpale & Summanwar (1983), Rao (1987) and Reddy & Rao (1989) reported the influence of temperature, relative humidity and rainfall on the population build of *B. tabaci* on cotton. Pruthi & Samuel (1942), Nene (1972), Murugesan & Chelliah (1978) and Lal & Pillai (1982) observed a positive correlation of maximum temperature with increase of *B. tabaci* population on tobacco, pulse crops and cassava. The contrasting result in the present findings may be due to the difference in the ecosystem of the crop. Castor, cassava, pulse crops and tobacco are annual crops raised in open conditions, whereas cardamom is a perennial crop raised under shade trees having a stable microclimate. Hence, the effect of microclimate prevailing in cardamom ecosystem is required to be investigated in relation to the population build up of *K. cardamomi* on cardamom.

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