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Research Notes

Correlation between Coccinellids (*Menochilus sexmaculatus* Fab.) (Coleoptera : Coccinellidae) on cotton and major weather factors in southern Tamil Nadu

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In a region, the size of the population of pests and the severity of damage they do can be governed by the environmental factors and natural enemies (Becker, 1974). Understanding the effect of environmental factors on the occurrence and density of pest and natural enemies is crucial in developing control strategies. Before going for any biocontrol programme, we must know the impact of environmental factors on the population dynamics of the biocontrol agents. The coccinellid, *Menochilus sexmaculatus* Fab. is the important predator on sucking pests in cotton ecosystem. Finding out the direct relationship between any single climatic factor and insect activity is difficult because the impact of weather parameters is usually confounded (Banerjee, 1972; Parker, 1946). However, temperature both minimum and maximum, total rainfall, total sunshine hours and per cent relative humidity are the chief weather parameters that largely direct the activity of a given species of an insect and their occurrence, development and survival. A thorough understanding of these aspects can help in finding opt time for the release of biocontrol agents. Effect of weather factors on the crop pests was earlier studied by Rote and Puri (1991) and Saminathan *et al.* (2001). The work on the influence of the weather factors on the natural enemies was limited. So a vast survey was made in two different districts of Tamil Nadu on the population of coccinellids *M. sexmaculatus* which is an important predator on the pests and bollworms on cotton and the population was correlated with the weather parameters.

The quantitative predator data on *M. sexmaculatus* for five years (1996-2000) during both summer and winter seasons were collected from the farmer's holdings at Vadugapatty, Srirengapuram, Vaigaidam, Thamaraikulam, Melmangalam, Bothipuram villages of Theni districts and Kovilankulam, Kattangudi, Periapuliampatty, Ramanujapuram, Kopalapuram, Sitalampudur, Sengula, Mamsapuram, Poovani and Malli villages of Virudhunagar districts. Observations were recorded at weekly intervals on 20 randomly selected plants in the field. Total number of egg, larval, pupal and adult population in the whole plant was recorded. As sampling holdings have represented varying varieties, cropping systems, crop protection measures and age group, upto 50 replications were used. The weather parameters *viz.* total rainfall per week and daily maximum and minimum temperatures, per cent relative humidity and total sunshine hours averaged over different weeks were collected from the locally stationed meteorological observatory at Agricultural Research Station, Srivilliputtur and Central Water Technology Centre, Aranmanaipudur during the period of study. The quantitative relationship between the weekly mean population and the weather parameters *viz.* maximum and minimum temperature, rainfall, relative humidity and sunshine hours were worked out by using method of correlation and regression analysis, and were expressed in the form of mathematical equations. The student 't' test (Fisher and Yates, 1938) was applied to test the significance at different levels (5 and 1%). The quantitative influence of each weather parameter prevailing during experimentation as well as one and two weeks prior to the corresponding period of infestation was also worked out separately.

Maximum temperature during same week and one and two the previous weeks were negatively correlated with the coccinellid population. The rate of decrease was 0.7, 0.66 and 0.7 coccinellid per 1°C increase in the maximum temperature. The correlation was significant at 1% level. In addition to the direct

Table 1. Influence of weather factors prevailing during the same week on the incidence of *Menochilus sexmaculatus*

Weather factor	R^2	Regression equation	Tabulated 't'
Maximum temperature	0.11	Y= -0.70 x -20.4	3.04**
Minimum temperature	0.10	Y= 1.03 x -21.09	2.78**
Total rainfall	0.001	Y= -0.006 x +3.54	0.3
Total sunshine hours	0.11	Y= -0.69 x +1.10	3**
Relative humidity	0.09	Y= 005 x +0.097	2.78**

Table 2. Influence of weather factors prevailing during the one previous week on the incidence of *Menochilus sexmaculatus*

Weather factor	R^2	Regression equation	Tabulated 't'
Maximum temperature	0.09	Y= -0.66 x -19.03	2.75**
Minimum temperature	0.09	Y= 1.11 x -22.9	2.77**
Total rainfall	0.01	Y= -0.02 x +3.94	1.15
Total sunshine hours	0.18	Y= 0.9 x +0.44	4.09**
Relative humidity	0.09	Y= 0.05 x +0.98	2.78**

Table 3. Influence of weather factors prevailing during two previous week on the incidence of *Menochilus sexmaculatus*

Weather factor	R^2	Regression equation	Tabulated 't'
Maximum temperature	0.10	Y= -0.70 x -20.4	2.91**
Minimum temperature	0.08	Y= 1.07 x -22.0	2.54*
Total rainfall	0.01	Y= -0.01 x +4.05	1
Total sunshine hours	0.19	Y= 0.96 x +0.26	4.17**
Relative humidity	0.10	Y= 0.05 x +0.97	2.91**

** Significant at 5% probability level * Significant at 10% probability level

effect of the maximum temperature on the coccinellids, effect on prey insects also fluctuates the predator population. Maximum temperature was negatively correlated with the sucking pests (Beshnoi *et al.* 1996; Saminathan *et al.*, 2001). Increase in the minimum temperature prevailing during the same week by 1°C increased the population of coccinellids by 1.03 numbers. Temperature prevailing at one previous week (r^2=0.09) and two previous weeks (r^2=0.08) were also positively correlated at 1 and 5% level. Earlier positive association of minimum temperature with jassids (Shyam Prasad and Logiswaran, 1997; Saminathan *et al.* 2001) was reported. The predator population (coccinellid) increased as the prey population (jassids) increased. During same week, one and two previous weeks correlation between rainfall and coccinellid population was negative but not significant. Increase in 1 mm rainfall during previous week decreased the population by 0.02 numbers. The negative correlation of rainfall is mainly due to the beating action of raindrops which dislodges the coccinellid eggs and washout the aphids and thrips population. The relationship between the sunshine hours and coccinellids was positive at 1 per cent level. One hour increase in the sunshine hour of the same week increased the population by 0.69 (r^2=0.11) one previous week by 0.9 (r^2=0.18) and two previous weeks by 0.96 (r^2=0.19). Relative humidity of the same and one and two previous weeks were positively

orrelated with the coccinellid population at per cent level. The rate of increase was 0.05 in all the weeks. Increase in the humidity avours the aphids and thrips, which supported he higher coccinellid population.

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Research Notes

Bioefficacy of betacyfluthrin against *Spodoptera litura*

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Defoliators often pose a serious problem in groundnut and cause significant yield loss, if left unchecked. Among defoliators, the tobacco caterpillar *Spodoptera litura* (Fab.) has assumed the status of serious pest of irrigated groundnut. The polyphagous nature of the pest allows it to survive on numerous alternative hosts, thus poses a big problem in the management (Ramana *et al.* 1988). Chemical insecticides have been extensively used to control *S.litura*, but the pest has developed resistance to most of the available organochlorine, organophosphate and carbamate compounds (Jaglan *et al.* 1997). There is therefore challenging interest in the discovery of novel insecticide molecules with different biochemical targets. Betacyfluthrin is a novel insecticide of pyrethroid group developed by Bayer and has a broad spectrum activity against lepidopteran, coleopteran and sucking pests. The present study was undertaken to evaluate the biocfficacy of betacyfluthrin against *S.litura* on irrigated groundnut.

Two supervised field experiments were conducted to evaluate the bioefficacy of betacyfluthrin against *S.litura*. The first field experiment was conducted at a farmer's field at Arasakuli in Cuddalore district of Tamil Nadu during summer 1998 with TMV 7 cultivar as an irrigated crop. The experiment was laid