Uttar Pradesh J. Zool. 22(1) : 67 - 71, 2002 ISSN 256 - 971X

FIELD DENSITY OF *APHIS GOSSYPII* GLOVER ON BRINJAL IN RELATION TO PREDATORY AND BIOTIC FACTORS

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Field density of aphid, *Aphis gossypii* Glover on brinjal var. 'Pusa Purple Round' were recorded for two consecutive cropping seasons 1999 and 2000. The study revealed that the incidence of the aphid began from second week of March and continued till the fourth week of June. The population reached its peak during May with the maximum abundance of 365.39 and 330.44 aphids/sampling unit during 1999 and 2000 respectively. The average mean temperature and relative humidity recorded were 25.15^{0}C and 70.71% respectively. The correlation coefficient between the pest and related abiotic and biotic parameters were calculated. The results showed positive correlation between the pest and temperature, relative humidity, wind speed and sunshine whereas negative relationship with the rainfall. Nine species of aphidophagous predators belonging to Coleoptera, Diptera and Neuroptera were recorded and found to be prey density dependent.

INTRODUCTION

Brinjal, *Solanum melongena* L. is an important vegetable crop grown all over India and is mainly consumed as food. In India, brinjal crop is infested by nearly 30 different groups of insects, which include as many as 142 species of insects (Ayyar, 1963; Sohi, 1966; Vevai, 1970; Butani & Verma, 1976; Hill, 1983). Of these, the cotton or melon aphid, *Aphis gossypii* Glover (Homoptera : Aphididae) is considered as major pest of brinjal (Butani & Verma, 1976). It is a polyphagous pest, attacking a wide range of plants belonging to 46 families (Roy & Behura, 1983). The nymph and adults are found in large numbers and they suck the cell sap from different parts of the plant. Heavily infested leaves turn yellow, get deformed, curled and dry up causing serious reduction in fruit yield (Agarwala & Raychaudhuri, 1981). Besides, causing direct losses, it is also capable of transmitting viral diseases on different host plants (Banerjee & Raychaudhuri, 1985; Eastop, 1961). Based on the economic importance of the pest, the present work was undertaken with the aim to study the field density of *Aphis gossypii* Glover in relation to abiotic factors and the activity of prèdators.

MATERIALS AND METHODS

Studies on the field density of *A. gossypii* on *Solanum melongena* L. (*var.* Pusa Purple Round) was conducted at the experimental field of the Department of Life Sciences, Manipur University for two consecutive crop seasons (1999 & 2000). Aphid population (both nymphs and adults) was assessed at 7 days interval from 15 plants selected at random. At each sampling, population count were made from three leaves, one each from lower, middle and upper strata from each plant. Besides, density of the associated predator *viz.* coccinellids (larvae & adults), syrphids (larvae) and neuropteran (larva) were also separately noted. In addition to biotic factors, density independent factors such as temperature, relative humidity, rainfall, sunshine and wind speed were taken periodically from nearby meteorological laboratory to work out the relation between aphid density and abiotic factors.

RESULTS AND DISCUSSION

The data on the incidence and occurrence of *A. gossypii* on *S. melongena* during two consecutive cropping seasons (1999 & 2000) revealed that the infestation of the aphid commenced during second week of March and continued till June. Initially the population of aphid was very low (0.44 & 0.22 aphids/sampling unit during 1999 & 2000 respectively) and it gradually increased with peak of 365.39 and 330.44 aphids/sampling unit (during 1999 & 2000 respectively) during third week of May and then gradually decreased. The period of aphid infestation during 1999 and 2000 was almost identical. An average temperature (23.75^{0}C, 25.54^{0}C), relative humidity (75.28%, 66.14%), rainfall (00.00 mm, 37.3 mm), sunshine (1.67 hrs, 9.4 hrs) and wind speed (5.15 km/hr, 4.9 km/hr) during 1999 & 2000 respectively were observed during peak period. Subsequent sampling also showed the presence of three predatory groups (coccinellids, syrphids and neuroptera) in the aphid colonies.

In the first cropping season (1999), both coccinellids and syrphids appeared after fourth week of the occurrence of aphid. The total population of predators ranged from 0.11 to 1.11 insects/sampling unit in different observation periods. The maximum abundance of predators with 1.11 insects/sampling unit (coccinellids, 0.44; syrphids, 0.67) was recorded during third week of May which was found coincided with peak density of the aphid. Altogether nine species of aphidophagous predators,. *viz*. five coccinellids (*Chilomenes sexmaculata* (Fabr.), *Coccinella transversalis* Fabr., *C. septempunctata* L., *Lemnia bisellata* (Mulsant) and *Scymnus* sp.), three syrphids (*Episyrphus balteatus* (DeGeer), *Ischiodon scutellaris* (Fabr.) and *Paragus serratus* F.) and one neuropteran (*Micromus timidus* Hagen) werefound associated with the aphid population.

In the second cropping season (2000), only seven aphidophagous predators *i.e.* four coccinellids (*Coccinella transversalis* Fabr., *C. septempunctata* L., *L. bisellata* (Mulsant) and *Scymnus* sp.), two syrphids (*Ischiodon scutellaris* (Fabr.), *P.serratus* Fabr.), and one neuropteran (*Micromus timidus* Hagen) were recorded in the aphid colonies. The incidence of syrphids and coccinellids started from the last week of March and first week of April respectively and continued till June. The total peak density of predators with 1.78 insects/sampling unit (coccinellids 1.67, syrphids 0.11) was observed during third week of May coinciding with the peak density of the aphid population (Fig. 1).

The population of predators gradually increased with the increase in aphid density. Several workers have also observed density dependent relationship between the population of aphids and natural enemies in several agroecosystem (Saha, 1988; Singh *et al*., 1995; Jalali *et al*., 2000). Among the predators, the coccinellid predators were more abundant in number and least being the neuroptera. Similar observation was also made by Jalali et al. (2000). Satpathi (1999) recorded 12 different insects (Coleoptera, Diptera, Neuroptera and spiders) as the predators of *A. gossypii* from West Bengal. Mani & Krishnamoorthy (1989) observed five coccinellids and two syrphids in the colonies of *A. gossypii* from Bangalore. Saha & Agarwala (1986) also reported six natural

Table 1 : Correlation between *Aphis gossypii* and biotic and abiotic factors.

Aphid gossypii as pest	Biotic predators		Abiotic parameters				
	Coccinellid	Syrphis	Temp. (^{0}C)	R.H. (%)	Raifall (mm)	Sunshine (hrs/day)	Wind speed (km/hr)
1999	0.544*	0.872*	0.109	0.152	-0.041	0.129	0.371
2000	0.794*	0.120	0.540*	0.004	-0.098	0.316	0.242

* Significant at 5% level.

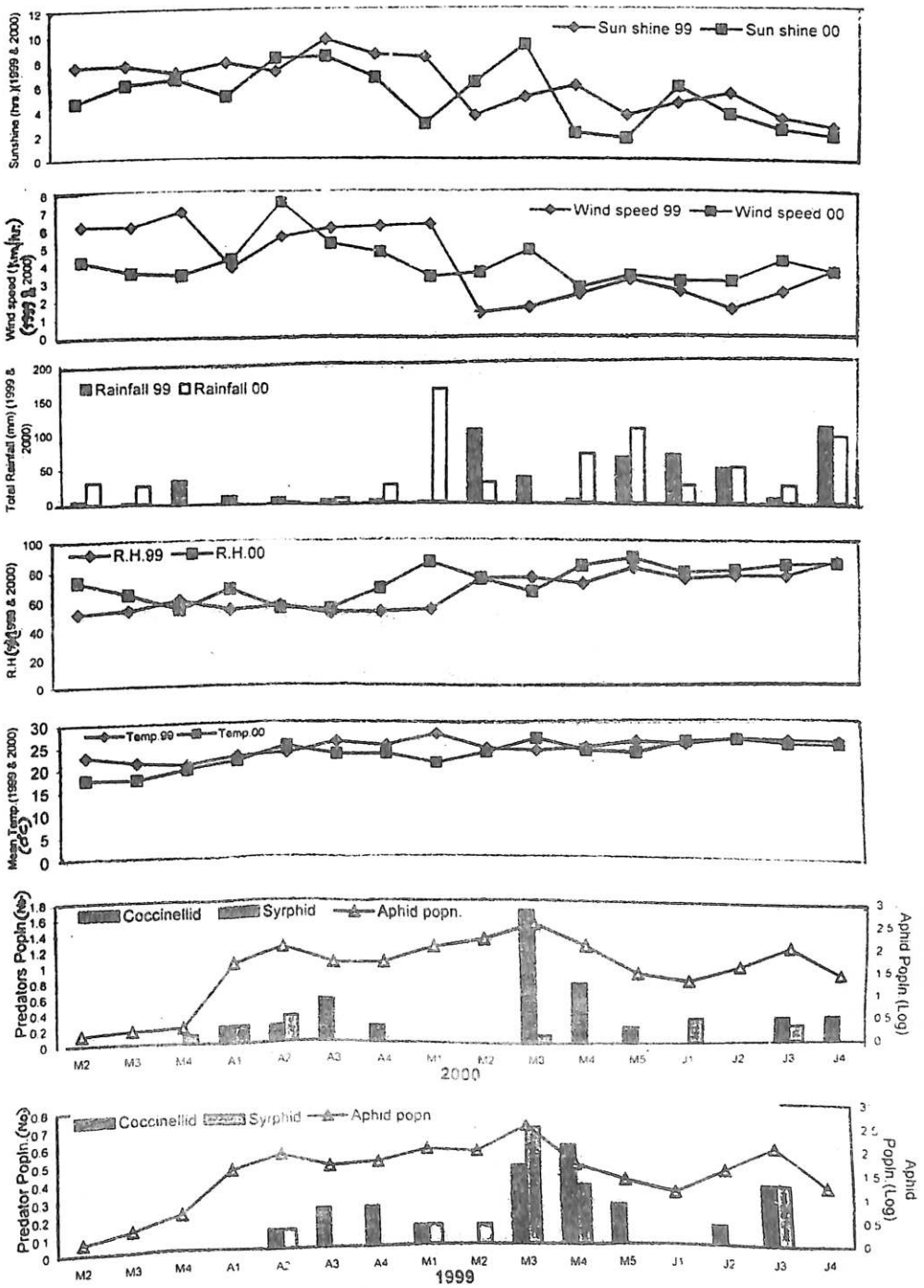

Fig. 1 : Seasonal abundance of *Aphis gossypii* in relation to biotic and abiotic factors on brinjal.

enemies (Coleoptera and Hymenoptera) on egg plant. In the present observation no activity of parasitoid on the aphid, could be recorded during the period of study.

The correlation coefficient of aphid and predators with abiotic factors are presented in Table I. The result showed positive relationship between aphid population and various abiotic factors such as temperature, relative humidity, sunshine and wind speed except rainfall. None of the abiotic factors showed significant influence on the aphid population except temperature in the second cropping season. Narang & Rana (1999) reported that among the abiotic factors, temperature and relative humidity play a significant role in the population regulation of *Rhopalosiphum maidis* (Fitch) and affect the aphid population on barley crop. Singh *et al.* (1995) reported the density of aphid, *A. gossypii* and independent factors showed non-significant negative correlation. Gupta *et al.* (1997) also reported that the population of *A. gossypii* revealed a negative correlation with relative humidity on cotton in Madhya Pradesh. Prasad & Logiswaran (1997) from Tamil Nadu recorded negative associations between aphid population and both wind speed and rainfall on brinjal. Kumar *et al.* (2000) had showed that the aphid population was noticed to have positive influence by temperature and negative by relative humidity as well wind velocity. In the present study, the correlation of *A. gossypii* with its predators had high significant positive association. This relationship showed that as the aphid density increases, the abundance of predators also rises up proportionately under the field condition. Saha & Agarwala (1986) and Singh *et al.* (1995) also made similar observation with the above finding. From this result as well as based on the seasonal occurrence and species composition of predators in relation to aphid population, the predators were found to have more influence in the suppression of *A. gossypii* population in the field. This result is substaintiated by the findings of Saha (1988), Singh *et al.* (1995), Narang & Rana (1999) and Satpathi (1999)

ACKNOWLEDGEMENTS

Authors are grateful to the Head, Department of Life Sciences, Manipur University for providing necessary facilities.

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