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Relative Abundance of Aphid *Lipaphis erysimi* (Kaltenbach) and Predator *Coccinella septempunctata* Linnaeus on *Brassica oleracea* Var *botrytis* in Relation with Abiotic Factors

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Abstract

The relative abundance of aphid *Lipaphis erysimi* (Kaltenbach) and predator *Coccinella septempunctata* Linnaeus colonies on *Brassica oleracea* var *botrytis* in relation with abiotic factors were conducted during 2003-05. The numerical density of the predator was observed to increase in response to increase in density of aphid prey in the field. The correlation analysis showed highly significant positive correlationship between predator and aphid species. Temperature, relative humidity and rainfall correlated negatively with predator and prey population whereas sunshine and wind speed correlated positively.
Key words : Abiotic factors, *C. septempunctata,* L. erysimi, Numerical density, Significant positive correlationship.

Caulifiower Brassica oleracea var botrytis being a winter vegetable, its productivity reaches maximum during winter season. It is widely cultivated as early, mid and late crop in Manipur. The vegetable is attacked and damaged by a large group of insect pests at different stages of its growth, which not only hampers the yield of the crop but also reduced the market value (1). Among various insect pests attacking cauliflower, the aphid, *Lipaphis erysimi* (Kaltenbach) was recorded as regular and most destructive pests of this crop, which act as limiting factors in its successful cultivation (2). In the plains and highland of north-east India, the adults and larvae of the coccinelled, *Coccinella septempunctata* L., are quite common during the cropping periods (3, 4). *C. septempunctata* is one of the commonest ladybird predators of aphids in agricultural and horticultural habitats (5). Although highly polyphagous, *C. septempuntata* shows preference to aphids infesting plants in low vegetative stands such as *Brassica* crops. Effectiveness of ladybeetles as predators of aphid pests in any agro ecosystem depends upon the understanding of the factors that influence its growth, prey preferences as well as abiotic factors. The low frequency of aphid outbreaks is generally attributed to the effect of natural enemies on density independent factors such as weather (6). The present paper aims to study these expects with reference to *C. septempunctata* predating on *L. erysimi.*

Methods

The seasonal abundance of the coccinellid predator, *C. septempunctata* L., and its prey *L. erysimi* was assessed on *Brassica juncea* var *botrytis* in the experimental field of Life Sciences Department, Manipur University for two subsequent crop seasons (2003—2005). There were 5 plots of 4×2 m^2 size each. The experimental plots were kept free from insecticides and recommended agronomical practices from the State Agricultural Department were followed. The spacing was 45 cm between rows and plants. Observations on the seasonal activity of *C. septempunctata* and its prey *L. erysimi* were made at 10 days interval. Density of both larvae and adults of the coccinelled were recorded from 20 randomly selected plants from five plots. Corresponding aphid counts were taken following Church and Strickland (7) method wherein three leaves, one each from upper middle and lower strata of the plant. The adult and nymphal morphs of aphids were thoroughly observed. The meteorological parameters for the period of study were recorded from the nearby meteorological observatory and the data thus collected were subjected to statistical meth-

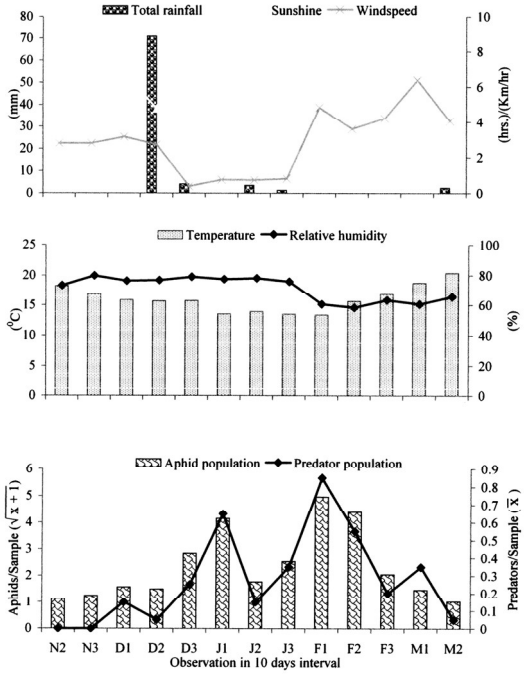

Figure 1. Population trend of *C. septempunctata* and *L. erysimi* with abiotic factors on *B. oleracea* var botrytis during 2003—04.

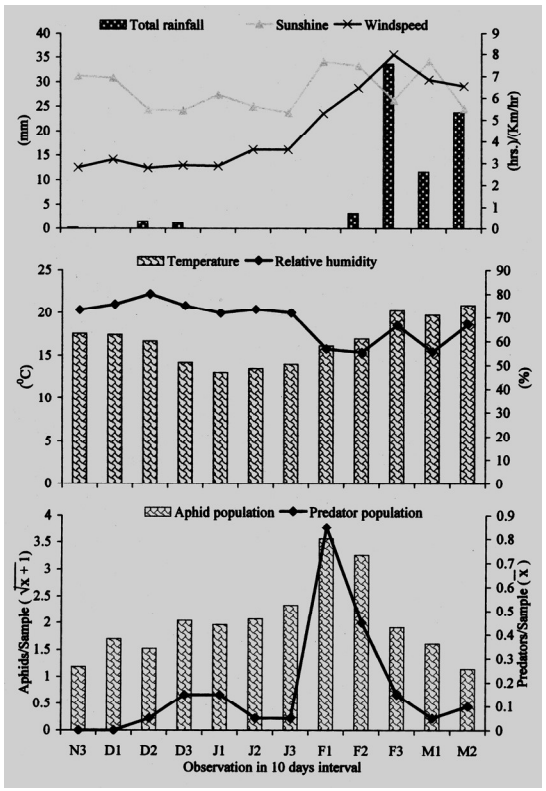

Figure 2. Population trend of *C. septempunctata* and *L. erysimi* with abiotic factors on *B. oleracea* var. *botrytis* during 2004—05.

ods of correlation analysis (8) to find out the relationships of environmental factors with population densities on the insect pest.

Results and Discussion

Data on the incidence of cauliflower aphid, *Lipaphis erysimi* infestation commenced during the third week of November with an initial population of 0.25aphids/sample in 2003-04 and continued till harvest of the crop during third week of March (Fig. 1). But in 2004-05, the prey population appeared during the last week of November with 0.40 aphids/sample and the peak abundance of 11.70 aphids/sample was also recorded during first week of February (Fig. 2). The peak population period of aphids in both the years were recorded during first week of February. Chandra and Kushwaha (9). Sharma et al. (10) and Devi et al. (1) observed more or less same period of high aphid activity on crudiferous crops in different parts of the country.

The predator's *Coccinella septempunctata* population first appeared on this crop during the first week of December (0.15 predator/sample) and increased intermittently revealing its maximum abundance during first week of February with 0.85 predator/sample which also coincided with the peak population of aphid. Thereafter the population of both prey aphids. Thereafter the population of both prey aphids and. Thereafter the population of both prey aphids and predator declined. Similar peak period of the predator and the aphid were also observed by Devi et al. (11) and Singh and Singh (4). The peak period witnessed an average temperature of 13.38C, relative humidity 60.70%, rainfall nil, sunshine 8.25 h and wind speed 4.84 km/h. In 2004-05, the predator's population appeared during second week of December (0.05 predators/sample) and the corresponding average temperature, relative humidity, sunshine and wind speed were 16.70C, 80.05%, 5.49 h and 2.80 km/h respectively with 1.60 mm total rainfall distributed. The

Table 1. Correlation co-efficient of *C. septempuctata* and *L. erysimi* with biotic and abiotic factors on *B. oleracea* var *botrytis*. *Significant at 5% level. **Significant at 1% level.

	Species	Years	L. erysimi	Temperature	Relative humidity	Total rainfall	Sunshine	Wind speed
1	*C. septempunctata*	2003–2004	0.9351**	-0.5829*	-0.4534	-0.2755	0.4909	0.1121
		2004–2005	0.9162**	-0.0655	-0.6420	-0.1044	0.4879	0.3064
2	*L. erysimi*	2003–2004		-0.5968*	-0.3934	-0.2057	0.6115*	0.0088
		2004–2005		-0.2656	-0.6103*	-0.2145	0.4566	0.2217

peak activity of the predator was observed over a period of days in the field during first week of February (0.85 predators/sample), which coincided with the peak population of aphid density. The aphid and predator showed a declining trend after February due to gradual increase in temperature. The pest was observed to colonize the lower strata of the plant to a greater extent. Correspondingly the predator was also were observed in greater number in the said strata.

The correlation coefficiency of the predator with its prey aphid with that of the abiotic factors showed in general that temperature, relative humidity and rainfall correlated negatively ($P < 0.05$) with predators and preys populations. Whereas sunshine and wind speed exhibited positive correlation with the predator as well as with prey population (Table 1) . Similarly Reddy et al. (12), Paul and Konar (13), Purohit et al. (14) observed the average temperature and rainfall to have a detrimental effect on coccinellid and aphid populations. Analysis on the density of the predators revealed that their abundance were more during certain months which synchronized with abundance of aphids. As such, highly significant positive correlations were obtained between predator and prey population (Table 1). The present results are in conformity with the earlier finding (4, 9—11), (14–19).

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