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STUDIES ON POPULATION DYNAMICS AND FEEDING POTENTIAL OF *COCCINELLA SEPTEMPUNCTATA* LINNAEUS IN RELATION TO *LIPAPHIS ERYSIMI* (KALTENBACH) ON CABBAGE

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ABSTRACT

Studies on population dynamics of *Coccinella septempunctata* Linnaeus and *Lipaphis erysimi* (Kaltenbach) on cabbage *Brassica juncea* var. *capitata* were conducted under field conditions 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 peak population of the prey and predator concided was found in the month of February. The correlation analysis showed highly significant positive correlationship between predator and aphid species. While temperature, relative humidity and rainfall exhibited negative correlation with predator and prey population however, sunshine and wind speed had positive correlation. Among the larval stages of *C. septempunctata*, the fourth instar larvae consumed more number of *L. erysimi* and in the adult stages female consumed more then male beetles.

Key words: *C. septempunctata*, *L. erysimi,* Numerical density, Significant positive correlationship.

The cabbage *Brassica oleraceae* var. *capitata* is cultivated in Manipur in an area of 1360 hactares. The crop was found infested by aphid species *Lipaphis erysimi* (Kaltenbach). The heavy infestation of aphid in general results in leaf curling, yellowing and stunted growth of the plant and thereby reducing its market value. The main predators of the aphid *L. erysimi* in India are coccinellid beetles, which have been reported to manage the pest population in the field (Agarwala *et al.* 1987, Afroze 2001). Consequently, in the plains and highland of north-east India, the adults and larvae of the *Coccinella septempunctata* Linnaeus are quite common during the cropping periods (Agarwala *et al.,* 1987). For the effective use of predaceous coccinellids in the integrated pest management programme, a complete investigation on their bioecology and predation potential are of utmost importance. The present study was, therefore, carried out to gather relevant information with particular reference to the agro-climatic conditions of Manipur.

MATERIALS AND METHODS

The seasonal abundance of the coccinellids predator, *C. septempunctata* L., and its prey *L. erysimi* was assessed on *Brassica juncea* var. *capitata* in the experimental field of Life Science 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 coccinellid were recorded from 20 randomly selected plant from five plots. Corresponding aphid counts were taken following Church & Strickland (1954) method wherein 3 leaves, one each from upper middle and lower strata of the plant were taken for observations. 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 analysis (Panse and Sukhatme, 1985) in order to find out the relationship of environmental factors with population densities on the insect pest.

The stock culture of *C. septempunctata* was maintained at 22 ± 2°C and relative humidity of 65 ± 5% on the leaves of host plant in the laboratory. To evaluate their feeding potential, the larvae and adult beetles from the stock culture were transferred individually to separate petridishes (9.5 cm diameter). One hundred *L. erysimi* were provided as prey. After 24 hours, the unconsumed aphids were counted in each set to record the number of aphids

consumed. The experiment was performed to evaluate the feeding potential of I, II, III and IV instars and adults of *C. septempunctata*. The experiment was replicated 10 times for each set.

RESULTS AND DISCUSSION

The primary objective of estimating the abundance of insect population is to determine the pest status and activity of the insect in a given agro-ecosystem. Since the damage caused by an insect is generally considered as a function of the population density of that species, for assessing the infestation level and to appraise the extent of damage, it is imperative to monitor the pest population periodically. Further, informations pertaining to pests that infest the crop year after year are rather important from the view point of pest control programme. Considering the aspects in the context of present work, it becomes essential to know the above said factors in details becuase *L. erysimi* is a seasonal pest of cabbage, inflicting damage every year especially under the climatic conditions of Manipur.

The incidence of *L. erysimi* commenced three weeks after the transplantation of the cabbage seedlings *i.e.* during third week of November in 2003-04 (Fig. 1). Later, their abundance gradually increased and highest peak production (111.35 aphids/sample) was observed in middle of February during which the mean temperature and relative humidity were 15.66°C and 58.40% respectively. In the second cropping year the prey initiated its incidence during last week of November with a population of 0.3 aphid/sample (Fig. 2). Its number went on increasing and its peak activity was observed in February, during which mean temperature of 16.16°C, relative humidity 56.9%, sunshine 07.67 hrs and 5.30 km/hr of wind speed were recorded. Lal *et al.* (2002) and Kumar (2007) observed more or less same period of high aphid activity on cabbage in different parts of the country. The pest density gradually declined after February.

Although the aphids were observed to be associated with an array of predators, in the present study, emphasis was given on the more abundant and voracious *C. septempunctata*. The larvae as well as adult stages of the predator were observed in the colonies from first week of December (0.05 predator/sample) in first year and its peak population (0.35 predator/sample) was observed during middle of February, which coincides with peak of the aphid population. Similar peak period of predator was observed by Devi (1998) and Sharma *et al.* (1997). In the second cropping season (2004-05), the prey population appeared during last week of November with 1.45 aphids/ sample (Fig. 2). After a steady increased in the population a peak of 243.25 aphids/sample was obtained during the first week of February.

The correlation analysis between the aphid and predator showed highly significant positive correlation (Table-1) in both the year. Similar observation were also reported by Atwal and Sethi (1963). The results revealed that temperature, relative humidity and rainfall correlated positively with aphid and predator density. The present results are in conformity with the finding of Devi (1998).

Table 1: Correlation co-efficient of *C. septempuctata* and *L. erysimi* with bioticc and abiotic factors on *B. juncea* var. *capitata*

S. No.	Species	Years	*L. erysimi*	Temperature	Relative humidity	Total rainfall	Sunshine	Wind Speed
1.	*C. septempuctata*	2003-2004	0.8095**	-0.2894	-0.5176	- 0.2360	0.4261	0.0776
		2004-2005	0.8653**	-0.0877	-0.8155**	-0.2365	0.4967	0.4511
2.	*L. erysimi*	2003-2004		-0.0608	-0.5384	-0.201	0.5646*	0.1740
		2004-2005		-0.3255	-0.6710*	-0.3603	0.4902	0.237S

* Significant at 5% level ** Significant at 1% level

The coccinellid was found to prey upon all the life stages of prey available within its reach. Table-2 shows the average number of prey *L. erysimi* consumed by *C. septempunctata* on pest of cabbage. The I, II, III and IV instars larvae (Table-2) consumed 07.01 ± 0.09, 14.92 ± 0.16, 28.26 ± 0.79 and 37.47 ± 0.21 respectively. Among the larval stage, highest voracity was observed in IV instars larvae. Among adult, female consumed (43.79 ± 0.48) more than male beetle (30.28 ± 0.29).

Table 2: Number of prey *L. erysimi* consumed by predator *C. septempuctata* per day

Predator stages	*L. erysimi* No. of consumed
Larva I instar	07.01 ± 0.09
Larva II instar	14.92 ± 0.16
Larva III instar	28.26 ± 0.79
Larva IV instar	37.47 ± 0.21
Adult female	43.70 ± 0.48
Adult male	35.28 ± 0.29

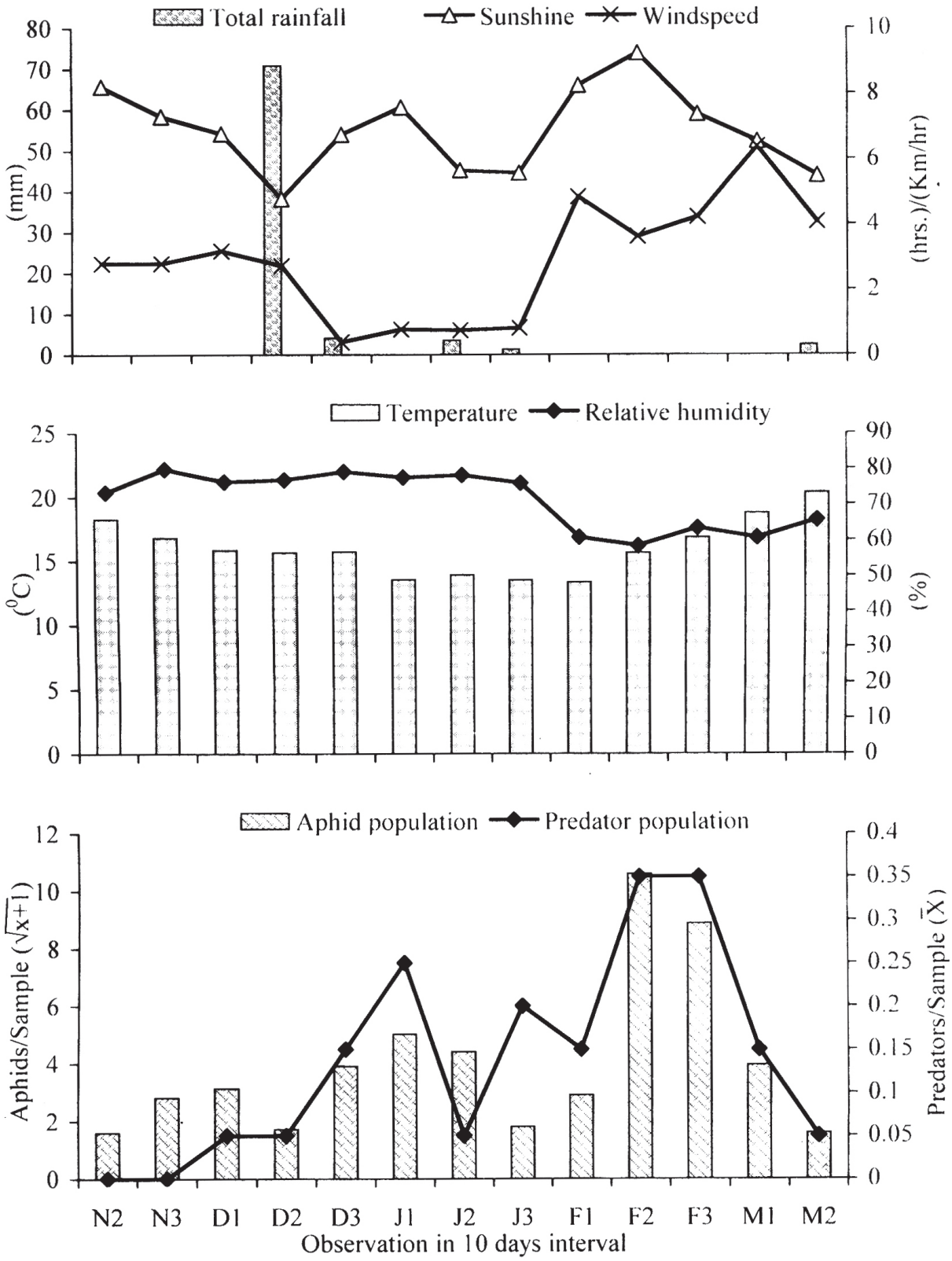

Fig. 1: Population trend of *C. septempunctata* and *L. erysimi* with abiotic factors on *B. oleracea var. capitata* during 2003-04

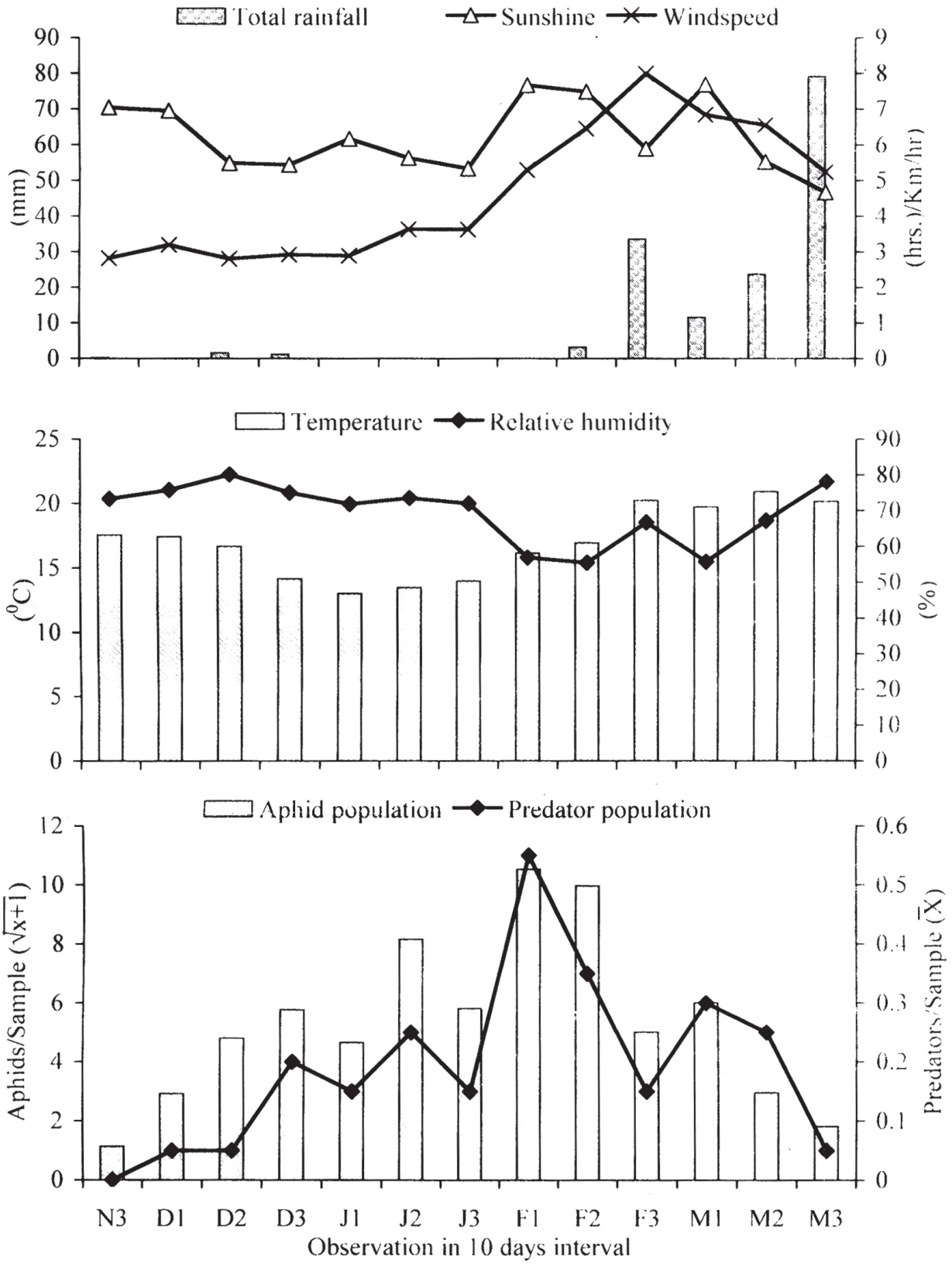

Fig. 2: Population trend of *C. septempunctata* and *L. erysimi* with abiotic factors on *B. oleracea var. capitata* during 2004-05

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