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Predatory Action of Coccinellid, *Cheilomenes sexmaculata* Fab. on Bean Aphid, *Aphis craccivora* Koch.

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ABSTRACT. Six species of coccinella beetles, Coccinella transversalis, Cheilomenes sexmaculata, Coclophora cardini, Aspidimenes circumflexus, Micraspis discolor and Thea cincta predatory on bean aphid, Aphis craccivora were collected from bean fields infested with aphids and the predatory action of C. sexmaulata larvae and adults were studied under laboratory conditions. Consumption of aphids by predator larvae increased with age, with a maximum consumption of 100-120 aphids per day by a fourth instar larva. This was significantly higher than the daily aphid consumption by adults (60-70 aphids per adult). Aphid consumption by both larvae and adult beetles increased with increase in number of prey insects supplied as food.

INTRODUCTION

Among natural enemies of aphids, coccinellid beetles have been proven to be effective than any other group of predatory insects (Obryki and Kring, 1998). About 36 species of aphidophagous coccinellids are reported in the Indian sub continent (Baskaran and Subramanian, 1992). A research study was carried out to identify coccinellids predatory on bean aphids and to verify their predatory action with the aim of mass culturing of efficient coccinellid species for field releases in future bean aphid management programmes.

MATERIALS AND METHODS

Adult coccinellids associated with bean aphids (*A. craccivora*) were collected using an aspirator from bean fields in Gannoruwa, Maturata, Thalathuoya and Maha Iluppallama from July to December 2000 and were identified using reference collections and available taxonomic keys. Two week old bean plants established in field plots and plant house were infested with bean aphids to maintain aphid cultures. Coccinellids were reared on these aphids.

Predatory action of six coccinella species was determined by feeding individual adult beetles kept in petridishes of 9 cm diameter with 150 aphids daily. Number of aphids consumed by each beetle was determined by counting the remaining number of aphids. Experiment was continued for seven days with six replicates. Consumption of aphids by adults and larvae of *C. sexmaculata* was determined by feeding individual larvae and newly

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emerged beetles with aphids kept in petridishes. Number of aphids consumed by each insect was recorded and predators were given 100 fresh aphids daily. Data were collected for a period of one week and moulting of coccinella larvae was observed to determine the larval instars. Effect of prey density on consumption of prey was studied by feeding individual newly emerged beetles and larvae with 150 and 300 aphids daily. Number of aphids consumed was counted and predators were supplied with fresh aphids daily. Number of eggs laid by each *C. sexmaculata* female fed with the two different numbers of aphids was recorded for a period of one week. Data were statistically analysed using SAS package.

RESULTS AND DISCUSSION

Six species of coccinellids, *Coccinella transversalis*, *Cheilomenes sexmaculata*, *Coclophora cardini*, *Aspidimenes circumflexus*, *Micraspis discolor* and *Thea cincta* were found feeding on bean aphids. *C. sexmaculata* was found to be the most abundant species and consumed 25% of the total number of aphids consumed by the six species (Table 1). Though, *C. transversalis* consumed 30% of the total number of prey, they were less abundant in the field than *C. sexmaculata*.

Table 1. Number of aphids consumed by each coccinellid species as a % of total number of aphids consumed by six species.

Coccinella species	% of aphids consumed
Coccinella transversalis	31
Chielomenes sexmaculata	24
Coclophora cardini	12
Aspidimenes circumflexus	10
Micraspis discolor	13
Thea cincta	11

Number of aphids consumed by individual larvae and adults of coccinella increased with age (Fig. 1). Compared to 10 aphids consumed by first instar larvae, second, third and fourth instar larvae consumed 22, 38 and 120 aphids respectively. However, the number of aphids consumed by adults was significantly lower than that of the fourth instar larvae. This indicates the higher efficiency of later larval instars in the regulation of aphid populations than adults.

Number of aphids consumed per day by both larvae and adults of *C. sexmaculata* increased significantly with increase in prey number from 150 to 300 (Fig. 2 and 3). This tendency of consuming more number of prey continued over the 7 day period of the experiment. Hodek (1967) also showed similar increase in prey consumption with increase in prey density. *C. sexmaculata* laid more number of eggs when 300 aphids were provided

than when 150 were provided. Agarwala and Bardhanroy (1999) showed a similar relationship between prey density and number of eggs laid by predator. This increased oviposition may be due to increased food intake or a positive response towards increased prey density as an assurance of food for the offspring.

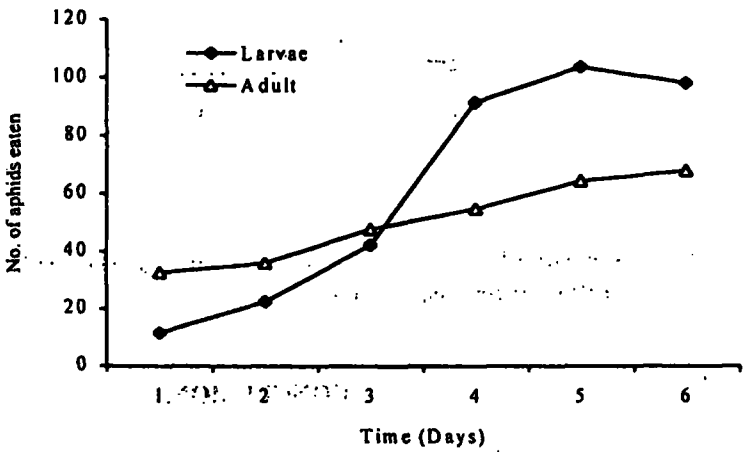

Fig. 1. Relationship between the feeding rate of one adult and one larva of *C. sexmaculata*.
[Note: Duration of 1st, 2nd, 3rd instar larvae was 1 day and 4th insta larva was 2 days].

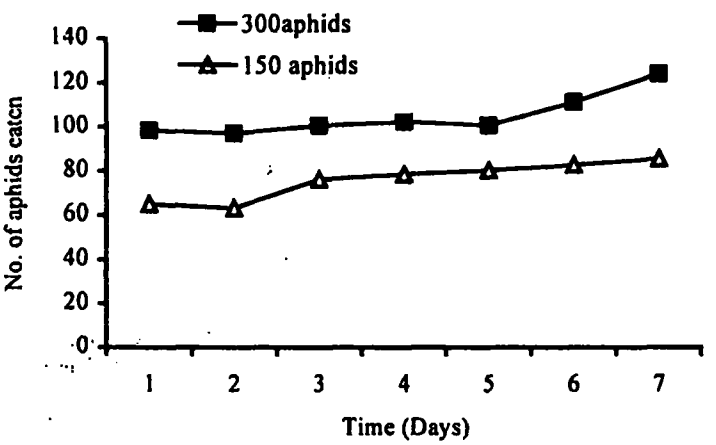

Fig. 2. Mean number of bean aphids eaten by one adult of *C. sexmaculata* under 2 different prey densities.

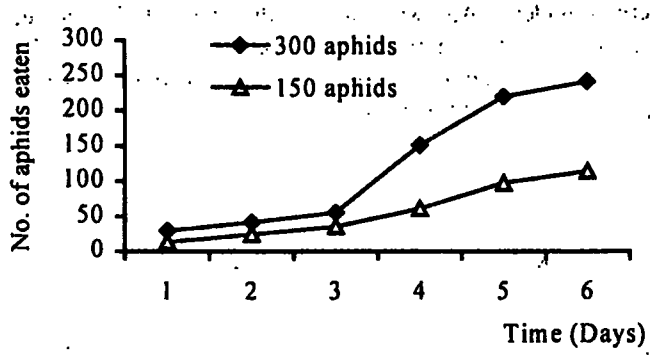

Fig. 3. Mean number of bean aphids consumed by one larva of *C. sexmaculata* under 2 different prey conditions.

CONCLUSIONS

C. sexmaculata was found to be an important predator of the bean aphid, *A. craccivora*. Consumption of aphids increased with larval development and the average daily consumption of aphids by an individual fourth instar larva was significantly higher than that of an adult. Both larvae and adults of *C. sexmaculata* consumed higher number of prey and laid higher number of eggs in the presence of more number of prey.

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