



Short Communication

Predation potential of ladybird beetle, *Coccinella septempunctata* (Linnaeus) (Coleoptera: Coccinellidae) against aphids infesting wheat

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Manuscript Received: 08.11.2021; Accepted: 01.06.2022

Abstract

The predation potential of grub and adult of *Coccinella septempunctata* (Linn.) was studied under laboratory conditions, in Department of Entomology, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India. The studies revealed that the duration of the 1st, 2nd, 3rd, 4th larval stage, pupae and adult of *C. septempunctata* was 2.0±0.71, 4.60±0.55, 4.80±0.84, 6.00±1.58, 4.20±0.84 and 38.80±1.66 days, respectively and the aphid consumption per day was 16.00, 16.19, 21.44, 18.55 and 36.80 aphids, respectively. The total number of aphids consumed during 1st, 2nd, 3rd, 4th and adult of *C. septempunctata* were 33.6, 72.6, 103.0, 112.0 and 1424.6, respectively.

Key words: *Coccinella septempunctata*, aphids, predation potential, coccinellids

Aphids (Hemiptera: Aphididae) are among the major pests causing serious economic damage to field and horticultural crops in various parts of the world. Due to their asexual and sexual reproduction, they are capable of an extremely rapid increase in numbers. In addition, these insects can transmit viruses. Aphids feed on wheat plants and inject saliva that contains plant toxins, which results in significant yield loss (Rabbinge *et al.* 1981). More than 11 aphid species infest wheat. Two species of aphids viz. *Rhopalosiphum padi* (Linnaeus) and *Sitobion avenae* (Fabricius) were found to infest wheat in Himachal Pradesh. (Jarosik *et al.* 2003). Seven different species of coccinellids and six species of syrphids have been reported to predate on aphids. For sustainable management of insect pests, there is need to promote abundance of arthropod natural enemies including predators, parasitoids and pathogens. Among these predatory populations keep aphid populations low, which can reduce or eliminate the need for chemical controls. Therefore, finding an eco-friendly potential method for reducing the pest population which does not target the beneficial insects becomes highly imperative. Before using a predator in biological

control, it is imperative to evaluate its efficacy against the target insect pests. Studies on predatory potential of coccinellids against aphid species on various crops has been carried out by many workers in India (Lakhanpal and Raj, 1998; Mishra and Sarangi, 2009; Pandi *et al.*, 2012; Manpoonet *et al.*, 2016; Dixit 2019). However, the information on the predation potential of *C.septempunctata* against aphids is lacking in the state of Himachal Pradesh. Therefore, the present studies were undertaken.

Raising stock culture of aphids: Stock culture of aphids was maintained in potted plants of wheat in the Department of Entomology in order to ensure availability of aphids to assess the predation potential. The aphids infesting wheat were collected from the field and allowed to multiply on the potted wheat plants.

Raising stock culture of Coccinellids: Rearing was done by collecting the mating pairs from the field and keeping them in glass jars provided with enough supply of food in form of twigs infested with aphids until oviposition. The glass jars were provided with crumpled paper to act as oviposition site. The eggs on the paper were removed with the help of camel hair

brush and transferred to petri dish for further studies. Rearing of coccinellids was done to study their predation potential on aphids.

Predation Potential: For the evaluation of predation potential of different larval instars, after hatching of the eggs, the grubs from stock culture were used and kept in separate petri plate of 9 cm diameter. For evaluating the predatory potential of the adult of *C. septempunctata*, pupae were collected from the stock culture and observed for their emergence. After their emergence they were kept in separate petri plates of 9 cm diameter. The larvae and the adult were daily fed with 40 and 75 aphids, respectively. Daily observations were recorded for the number of aphids consumed by each developmental stage after an interval of 24 hours. The experiment was replicated five times. The data obtained were analysed by using one-way analysis of CRD through online statistical software OPSTAT (Sheron *et al.*, 1998). The results obtained are presented and discussed here.

Predation potential of grub of *C. septempunctata*: The studies revealed that the average duration of first, second, third and fourth instars of *C. septempunctata* were 2.0±0.71, 4.60±0.55, 4.80±0.84, 6.00±1.58 days, respectively (Table 1). The total duration of the grub was 17.40±1.51 days. The mean aphid consumption per day by first, second, third and fourth larval instar was 16.00±1.67, 16.19±1.16, 21.44±0.08

and 18.52±0.23, aphids respectively. The number of aphids consumed increased at each successive stages of the predator. The total aphids consumed during the first, second, third and fourth larval instar were 33.6, 72.6, 103.0 and 112.0 aphids, respectively. Aphid consumption during the third larval instar was significantly higher than the first and second larval instar. Whereas the consumption during the 3rd and 4th instars were statistically at par with each other.

The present findings are in conformity with the earlier findings of Mishra and Sarangi (2009) who reported that the 1st, 2nd, 3rd and 4th instar grubs consumed 43.0±2.45, 64.3±14.63, 169.6±26.94 and 260.3±28.52 aphids, respectively. Unal *et al.* (2017) also reported that the third and fourth larval forms were highly voracious.

Predation potential of adult of *Coccinella septempunctata*: The studies showed that the average duration of the adult beetle was 38.80±1.66 days. The feeding potential of the adult per day was 36.80±1.60 aphids (Table 1). Total aphid consumption during the adult stage was 1424.6 aphids, comparatively higher than all four larval stages of the *C. septempunctata*. The present findings corroborate the earlier findings of Ehsan *et al.* (2020) who reported that *C. septempunctata* preyed on 30.68± 1.00 aphids per day. Kumari *et al.* (2020) reported the mean consumption of adult beetle of 77.02 aphids per day; however the

Table 1. Aphid consumption by various developmental stages of *C. septempunctata*

Developmental stage	Duration (days)	Number of aphids consumed per day		Total number of aphids consumed	
		Range	Mean	Range	Mean
First instar	2.00±0.71	12.00-20.00	16.00 (4.10)	12-55	33.60 (5.71)
Second instar	4.60±0.55	12.40-19.40	16.19 (4.14)	61-87	72.60 (8.55)
Third instar	4.80±0.84	21.20-21.60	21.44 (4.74)	85-108	103.00 (10.15)
Fourth instar	6.00±1.58	18.00-19.20	18.52 (4.42)	90-154	112.00 (10.53)
Adult	38.80±1.66	31.90-41.40	36.80 (6.14)	1232-1750	1424.60 (37.68)
	CD (P=0.05)		(0.37)		(2.11)

Figures in Figures in parentheses are the square root transformed values; Values are mean of 5 replications

difference may be due to difference in temperature conditions prevailing in the laboratory. Hence, it can be concluded that *C. septempunctata* can be utilised as component of integrated pest management

programmes for the management of aphids in wheat under mid-hill conditions in Himachal Pradesh.

Conflicts of interest: The authors declare that there is no conflict of interest in this research article.

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