



## Research Note

# Biological control of rose aphid (*Macrosiphum rosae*) using coccinellid beetle (*Coccinella septempunctata*) under field conditions in Gujranwala, Pakistan

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**ABSTRACT:** Aphids or plant lice are serious pests of various crops including rose. They damage leaves directly by sucking cell sap and indirectly by excreting honeydew, which encourages sooty mold growth. This direct and indirect damage affect plant growth and development. Beetles from family Coccinellidae feed on these aphids and reduce their population in the crop field. A study was conducted to assess the feeding efficacy of predatory beetle, *Coccinella septempunctata* on rose aphid, *Macrosiphum rosae* in rose garden at tehsil Mokhal Sandhuan, district Gujranwala, Pakistan. Observations on selected rose plants were made for 30 minutes during dawn and dusk in the month of March 2019. Foraging of *C. septempunctata* on prey species of aphid was observed on different parts of rose plant (upper and lower quadrats). Predation rate of *C. septempunctata* was higher in the morning and also on the upper parts of selected rose plant.

**KEY WORDS:** *Coccinella septempunctata*, feeding efficacy, *Macrosiphum rosae*

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The Coccinellidae family consists of about 6000 described species worldwide (Slipinski, 2007). The family consists of ladybird beetles (Hawkeswood, 1987) of which, *Coccinella septempunctata* L. is one of the most widely distributed species. It is a small sized beetle, ranging from 7.6-10 mm, orange coloured with 7 black spots on its body. Thorax is black in color with pale yellow patches at the front corners (Lyneborg, 1976). Female lays yellow colored eggs on leaves in small batches (Joy, 1933). Larvae are of black in color with yellow markings on their body (Buczacki, 2002). The distribution of aphids may influence predation, as aggregated aphids derive benefit from enemy-free space (Bommarco *et al.*, 2007).

Aphids suck sap from leaves and shoots which results in yellowing, distortion of leaves, curling and retarded development (Akhter and Khaliq, 2003). Often the infestation of aphid results in the disfiguring of foliage by deformation of buds and crippling of shoots (Becker, 1997). They also excrete honey dew which encourages sooty mold development thereby reducing the photosynthetic area of the plants (Zia *et al.*, 2010). *Coccinella* showed a close synchronization with their prey species (especially aphids) where they reproduce

rapidly when the prey species are increasing in number and become sluggish when the prey population declines (Kenneth and Hagen, 1970). The thermal adaptation of coccinellids is also important in choosing them as biocontrol agents (Frazer and McGregor, 1992). Predaceous lady birds will feed on a variety of soft bodied insects like aphids, mealy bugs, scale insects, mites and leaf hoppers (Omkar and Bind, 1996).

For the last few years, aphid's population has been increasing and gaining the status of an alarming pest in Pakistan. Aphid infestation was observed on various crop plants where both nymphs and adults suck the cell sap and reduce the plants' vigor and growth. Lady bird beetle have longer oviposition period and high reproductive potential. The conditions for the natural enemies for their success depends on their ability to adapt to different environmental conditions, good searching ability and synchronization with the host and have high reproductive rate (Buchanan, 1996).

*Coccinella septempunctata* known to develop on a wide range of aphid species (Majerus and Kearns, 1989) under laboratory conditions. The mean daily consumption of aphids by a pair of *C. septempunctata* was recorded as 32 individuals

in case of *Hyalopterus pruni* and 41 individuals in case of *Schizaphis graminum* (Varvara *et al.*, 1982).

Keeping in view, the economic importance of coccinellids as a biological control agent, the predatory efficiency of *C. septempunctata* against *Macrosiphum rosae* was studied in the field.

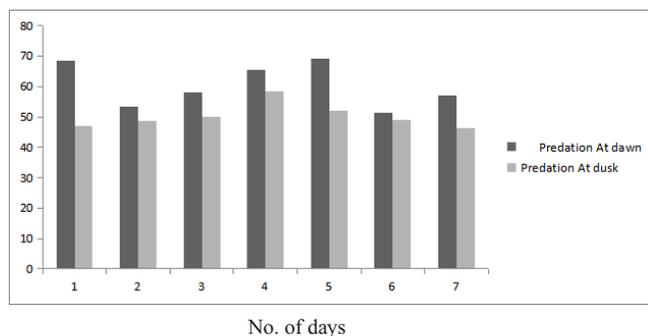
### Site of Collection

The present study was designed to determine the feeding efficacy of *C. septempunctata* in rose garden in district Gujranwala, Pakistan. The city covers an area of approximately 3.198 KM<sup>2</sup>. The maximum average temperature is 36–42°C during summer and 7°C during winter.

**Table 1. Weekly mean predation of *Coccinella septempunctata* on *Macrosiphum rosae* at dawn and dusk on selected parts of rose plant**

Feeding time (AM/PM)		Mean ± SD of aphids consumed/day	
At dawn (AM)	At dusk (PM)	At Dawn	At Dusk
4.20	7.30	68.57 <sup>a</sup> ± 3.65	47.09 <sup>a</sup> ± 2.34
4.30	7.40	53.34 <sup>b</sup> ± 2.78	48.62 <sup>a</sup> ± 1.46
4.40	7.50	65.42 <sup>a</sup> ± 2.72	58.55 <sup>b</sup> ± 2.33
4.50	8.00	69.01 <sup>a</sup> ± 2.33	52.02 <sup>b</sup> ± 2.0
5.00	8.10	51.31 <sup>c</sup> ± 1.45	49.11 <sup>c</sup> ± 1.55
5.10	8.20	57.03 <sup>c</sup> ± 1.57	46.32 <sup>c</sup> ± 1.50
Mean		60.3	51.9
SD		3.24	2.32
LSD		1.25	3.25

Note: Means followed by a common letter(s) are not significantly different by LSD (P = 0.05).



**Fig. 1.** Mean predation of *Coccinella septempunctata* on *Macrosiphum rosae* at dawn and dusk on rose plant.

### Observation techniques

The rose crop spreading over an area of one Marla is selected for visual observation of predatory potential of coccinellid, *Coccinella septempunctata* on rose aphid, *Macrosiphum rosae* (L.). Visual observations are made on daily basis during dawn and dusk of March 2019. The time taken by the predator for predating the aphids were observed and recorded. Observations were carried out on the twenty randomly selected plants. The number consumed by adult beetle per day in upper and lower leaves of the rose plant was observed and recorded.

### Statistical analysis

The statistical test ANOVA was also used to check any significant difference (P<0.050) in the collection. Randomized Block Design (RBD) to find Least Significant Difference (LSD). All these statistical analyses were done using Minitab 2018 version.

The results showed that *Coccinella septempunctata* adult beetles fed more number of aphids (*Macrosiphum rosae*) at dawn as compared to dusk. Consumption rate was statistically significant (p<0.05) as it is 60.39 ± 2.73 at dawn and 51.94 ± 1.88 at dusk. Thus the predation efficiency of the beetle was comparatively higher during dawn. *Coccinella septempunctata* insatiably fed on rose aphid but their feeding rate was found to vary. The consumption rate was found to increase steadily at dawn with an average of 60.39 ± 2.73 while the consumption rate at the dusk was found to decrease with an average of 51.94 ± 1.88. According to Agarwala and Bardhanroy, (1999), coccinellids are viewed as potent biocontrol agents due to their efficient predation and good control of several phytophagous insect pests. Inayatullah *et al.* (2005) reported three species of the genus *Coccinella* from district Poonch of Azad Jammu and Kashmir. *Coccinella septempunctata*, was reported to feed vigorously on nymphs and adults of aphids (Nenezperez *et al.*, 1992). Under the natural conditions, the population of aphids may increase very quickly as they are 'r' strategists but they can be restricted by the foraging potential of coccinellids (Gilkeson and Kelin, 2001).

Being environment friendly, the use of bio-control agents is conceived as an important component of Integrated Pest Management program. In developed countries the floriculturists are avoiding the use of insecticides on flowers

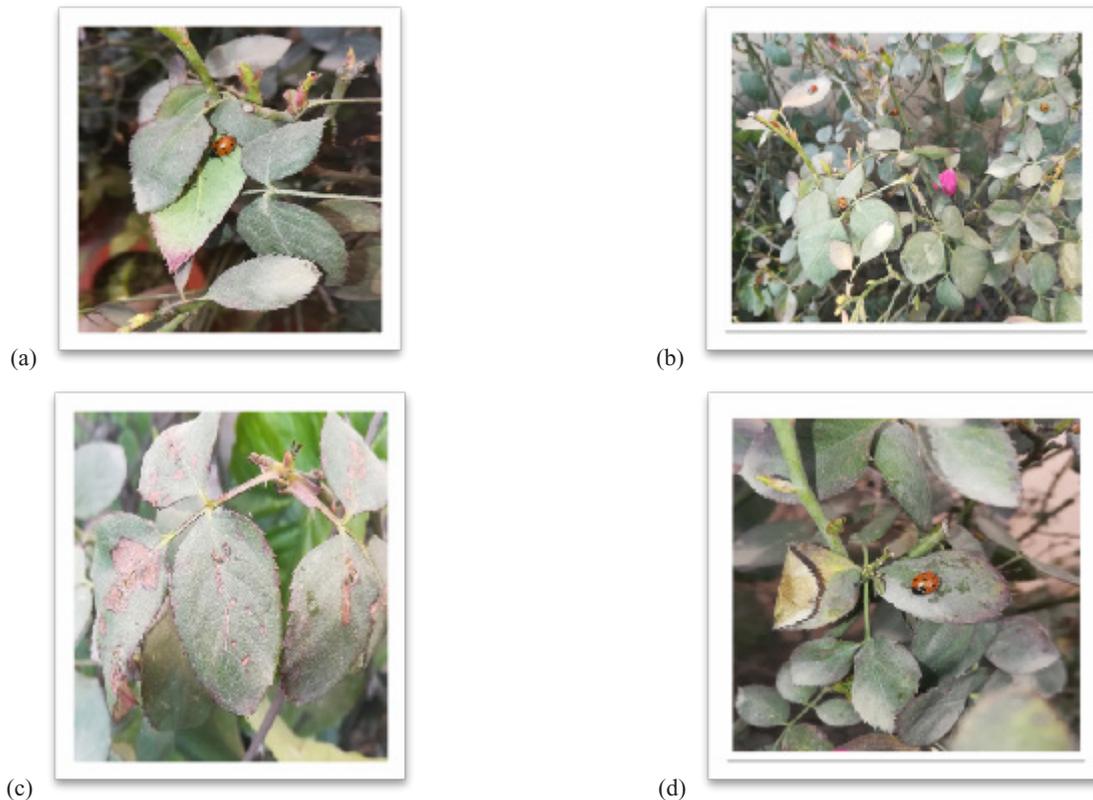


Fig. 1. *Coccinella septempunctata* feeding on rose aphid and infestation of rose plant.

and aphids are being controlled by natural enemies since last two decades. The coccinellids play a greater role in management of sucking pests in several agro-ecosystems. *Coccinella septempunctata* is considered a good bio control agent due to its predation efficiency coupled with its short life cycle. There is much scope for research to be taken on these aspects in future and be tried against sucking pests of vegetables.

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