



Effect of *Lipaphis erysimi* (Kaltenbach) numbers on the feeding potential of *Coccinella septempunctata* Linnaeus

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ABSTRACT: Effect of population density of mustard aphid *Lipaphis erysimi* (Kaltenbach) on the feeding potential of second instar larva and adult of *Coccinella septempunctata* Linnaeus were studied under laboratory conditions. Aphids at various densities, viz., 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100, were provided to second instar larva and adult of *C. septempunctata* in two separate sets of experiments. Significantly highest (32.25) number of aphids were consumed by the second instar larva after 12 hour of release at population level of 90 aphids, which was on a par with population levels of 70 (26.050), 80 (30.75) and 100 (31.25) aphids. Significantly highest feeding rate of 2.68 aphids / hour was recorded at 90 aphids, which was on a par with population level of 80 (2.55) and 100 (2.60) aphids. Similarly, significantly highest (55.00) number of aphids was consumed by the adult after 12h of release at population level of 100 aphids, which was on a par with population level of 60 (45.00), 70 (45.00), 80 (44.50) and 90 (52.00) aphids. Significantly highest feeding rate of 4.57 aphids per hour was recorded at population level of 100 aphids, however it was on a par with population level of 90 (4.33) aphids. The studies revealed that the feeding potential of larva and adult of *C. septempunctata* significantly increased with increase in population density of mustard aphid.

KEY WORDS: *Coccinella septempunctata*, feeding potential, *Lipaphis erysimi*, population density

Coccinella septempunctata L. is the most predominant and efficient predator of mustard aphid, *Lipaphis erysimi* (Mathur, 1983, Nirmala Devi *et al.*, 1996, Debraj and Singh 1989, Soni *et al.*, 2004, Gour and Pareek, 2005). *C. septempunctata* cuts down aphid populations to a great extent in nature. But the feeding efficiency of a predator is greatly influenced by the population density of prey (Murdoch and Marks, 1973). Therefore, experiments were conducted to know the effect of population density of mustard aphid on the feeding potential of second instar larva and adult of *C. septempunctata* in the laboratory.

The experiments were conducted in complete randomized block design with four replications in the Department of Plant Breeding, Genetics and Biotechnology of Punjab Agricultural University, Ludhiana. The adults of *C. septempunctata* were collected from the field and a culture was raised in the laboratory by providing mustard twigs infested with aphid. Counted number of *L. erysimi*, i.e., 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100, were provided to one second instar larva of *C. septempunctata* in battery jars covered with muslin cloth. Observations were recorded on the number of aphids consumed by the larva of *C. septempunctata* after 4, 6, 8, 10 and 12h of release at all population levels. Similarly

Table 1. Effect of mustard aphid numbers on the feeding potential of second instar larva and adult of *C. septempunctata*

Number of aphids provided	Mean number of aphids consumed (Hrs after release)										Feeding rate	
	4		6		8		10		12		Number of aphids consumed/ hour	
	G	A	G	A	G	A	G	A	G	A	G	A
10	4.00 (2.21)	4.75 (2.21)	7.00 (2.82)	8.00 (2.92)	8.50 (3.06)	9.00 (3.14)	9.50 (3.23)	10.00 (3.31)	10.00 (3.31)	10.00 (3.31)	0.83	0.83
20	2.25 (1.86)	6.50 (2.52)	5.25 (2.49)	11.00 (3.33)	7.75 (2.95)	13.25 (3.69)	11.50 (3.52)	16.25 (4.17)	13.00 (3.72)	17.25 (4.28)	1.08	1.45
30	3.50 (2.11)	8.75 (3.07)	6.50 (2.73)	13.00 (3.69)	10.0 (3.31)	17.00 (4.20)	13.75 (3.82)	20.00 (4.57)	18.50 (4.40)	24.75 (5.07)	1.53	2.05
40	5.50 (2.54)	7.50 (2.71)	9.00 (3.74)	15.25 (3.93)	12.0 (3.59)	20.0 (4.51)	15.25 (4.01)	25.25 (5.07)	17.25 (4.24)	31.00 (5.63)	1.43	2.58
50	5.00 (2.44)	9.00 (3.11)	8.50 (3.07)	15.26 (4.00)	13.00 (3.71)	20.5 (4.61)	16.25 (4.15)	26.25 (5.20)	21.50 (4.73)	32.50 (5.78)	1.99	2.70
60	5.50 (2.52)	10.25 (3.33)	8.50 (3.07)	18.25 (4.33)	13.50 (3.80)	23.75 (4.95)	19.50 (4.50)	30.0 (6.12)	25.00 (5.07)	45.0 (6.75)	2.08	3.12
70	6.25 (2.68)	15.75 (3.99)	10.75 (3.42)	24.25 (4.92)	15.75 (4.08)	31.25 (5.58)	21.50 (4.72)	37.25 (6.16)	26.50 (5.23)	45.0 (6.75)	2.20	3.74
80	7.50 (2.90)	12.50 (3.62)	12.25 (3.66)	22.0 (4.73)	20.00 (4.58)	30.0 (5.54)	20.75 (5.26)	37.25 (6.16)	30.75 (5.62)	44.50 (6.73)	2.55	3.70
90	8.25 (3.01)	13.75 (3.80)	13.25 (3.78)	27.50 (5.24)	20.00 (4.56)	35.25 (5.94)	20.25 (5.23)	42.25 (6.25)	32.25 (5.76)	52.0 (7.24)	2.68	4.33
100	9.00 (3.14)	15.00 (3.90)	13.25 (3.78)	29.50 (5.37)	19.00 (4.45)	37.50 (6.08)	25.50 (5.14)	45.25 (6.74)	31.25 (5.67)	55.00 (7.45)	2.60	4.57
CD (P = 0.05)	(0.46)	NS	(0.41)	(1.47)	(0.47)	(1.26)	(0.52)	(0.96)	(0.54)	(0.72)	0.45	0.80

Figures in parentheses are $\sqrt{n+1}$ transformed values; G = larva; A = adult

the effect of population density of mustard aphid on the feeding potential of adult of *C. septempunctata* was also studied by releasing single adult in each of the above mentioned population levels of mustard aphid in a separate set of experiment.

The number of aphids consumed by second instar larva after 12h varied from 10.0 to 31.25 as the population density of mustard aphid increased from 10 to 100 aphids (Table 1). Significantly highest number of aphids (32.25) was consumed by second instar larva at population level of 90 aphids as compared to population levels of 60 (25.00), 50 (21.50), 40 (17.25), 30 (18.50), 20 (13.00) and 10 (10.00). However, it was on par with population level of 70 (26.50), 80 (30.75) and 100 (31.25) aphids. Similarly, the feeding rate of second instar larva increased with increase in population level of mustard aphid. Highest feeding rate of 2.68 aphids / hour was observed at the density of 90 aphids, which was on par with that at 80 (2.55) and 100 (2.60) (Table 1). The number of aphids consumed by the adult after 12h varied from 10.0 to 55.0 as the population level of mustard aphid increased from 10 to 100. Significantly highest number of aphids (55.00) was consumed at the density of 100 aphids as compared to that of 50 (32.50), 40 (31.00), 30 (24.75), 20 (17.25) and 10 (10.00) aphids. However, it was on par with population level of 60 (45.00), 70 (45.00), 80 (44.50) and 90 (52.00) aphids. The feeding rate increased from 0.83 to 4.57 aphids / hour with increase in population density from 10 to 100 aphids. The highest feeding rate (4.57 aphids / hour) was observed at the density of 100, which was on par with that of 90 (4.33) (Table 1).

The present studies confirmed that prey density has significant influence on the feeding potential of coccinellids. The feeding potential of second instar larva and adults of *C. septempunctata* significantly increased with increase in population density of mustard aphid. It may be due to increase in searching and feeding

behaviour of coccinellids as the prey density increases. Probability of contact with the prey tends to increase at higher prey densities (Murdoch and Marks, 1973). Similarly, Hagen and Bosch (1968) also reported that aphidophagous coccinellids are attracted to higher prey population. Soni *et al.* (2004) reported that second instar larva and adult of *C. septempunctata* consumed higher numbers of *L. erysimi* in 24h under unstarved conditions when 100 aphids were provided as food.

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