

VORACITY RATE AND DEVELOPMENT PERIOD OF *COCCINELLA TRANSVERSALIS* (FABRICIUS) ON THREE APHID SPECIES

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ABSTRACT: A laboratory experiment was conducted to study the voracity rate of adults & larvae of *Coccinella transversalis* F. to evaluate their effectiveness as biocontrol agent against aphid species. The relative consumption rate of first, second, third and fourth instar larvae was significantly different on *A. gossypii* (17.11, 35.05, 53.61 and 78.77 nymphs/day), followed by *A. nerii* (5.40, 14.80, 32.70 and 65.03 nymphs/day) and *L. erysimi* (4.0, 9.34, 17.80 and 31.96 nymphs/day) respectively. Similarly, relative consumption rate of adult female and male was higher on *A. gossypii* (145.08 and 121.04 nymphs/day), followed by *A. nerii* (62.93 and 58.27/ nymphs/day) and *L. erysimi* (56.56 and 44.99 nymphs/day), respectively. The statistical analysis showed that there was significant ($P < 0.05$) difference in the consumption rate and development period of adult and larvae of the predatory beetle.

KEY WORDS: *Coccinella transversalis*, *Aphis gossypii*, *Aphis nerii*, *Lipaphis erysimi*, Voracity rate, Development period

INTRODUCTION

Biological control is major component of Integrated Pest Management (IPM) strategies. The aim of biological control is to reduce pest populations through natural enemies, such as predators, parasitoids and pathogens. (Gilkeson and Kelin, 2001)[1]. *C. sexmaculata* tended to exhibit lower predatory efficiency than *C. transversalis* Babu, and Ananthakrishnan, (1993)[2]. Feeding preference of *Coccinella transversalis* for 3 aphid species was investigated, highest numbers of *Aphis gossypii* were consumed within 1 h (41.42), followed by *A. nerii* (38.48) and *Pentalonia sp.* (30.42). Consumption of all 3 species decreased in later hours. George, (1999)[3]. Many natural enemies like *C. transversalis*, *C. septempunctata*, *Cheilomenes sexmaculatus*, and others influenced on the population of *L. erysimi* on *Brassica juncea* during January to February under field conditions. Panda *et al.* (2000)[4]. Coccinellid predators associated with mustard aphid, *L. erysimi* infesting mustard. Among predators *C. septempunctata* and *C. transversalis* were important aphidophagous coccinellid predators of *L. erysimi*. Singh *et al.* (2000)[5].

Similarly female beetles of 8, 10, 20 and 30 days age mated more frequently than young beetles. The overall data also suggested that adult beetles of *C. transversalis* preferred more food and their feeding rate (%) was higher on *A. gossypii*, followed by *A. nerii* and *L. erysimi*. Moore and Moore [6]

MATERIALS AND METHODS

A laboratory experiment was conducted at 26 ± 2 °C, R.H. $65 \pm 5\%$ in the Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University, Tando Jam.

Culture development

Culture of adult Transverse beetle, *Coccinella transversalis* was collected from mustard, maize, cotton, brinjal, okra, nerium, sunflower and other crops. The adults were brought

to laboratory and confined in cubicular wooden cage (25"×10"×15"cm). The side of cages were secured by wire gauze and front of each cage had an operator/observer hole guarded by muslin cloth sleeve to provide food for predators. The fresh young leaves of host plants containing the aphids (prey) were provided daily to the adult predators.

Larval (grub) instar

After hatching from eggs, the first instars larvae of the transverse beetles were transferred into Petri dishes (9 cm. dia.) by camel hairbrush. Various densities, 20, 40, 70 & 90 of aphid species nymphs on fresh host leaf sections were provided in Petri dishes and replicated five times. This was repeated in 1st, 2nd, 3rd and 4th instars larvae. The aphid consumption of each larval instars of each predator was observed at 24 hrs daily until the larvae entered into next development stage. The experiment was continued till pupate.

Adult

Newly emerged adults of each coccinellid beetle were collected from pupal culture at random. Male and female adults were kept separate in Petri dishes and same experiment was repeated by providing various densities, 140 & 160 of *A.gossypii*, *A. nerii*, *L. erysimi* nymphs on fresh host leaf sections to each adult beetle. The consumption of aphids was recorded at 24 hrs daily by counting the number of remaining alive aphid species. The experiment was repeated five times.

RESULTS AND DISCUSSIONS

Cotton aphid, *Aphis gossypii*

i. Larval instars

The perusal of data indicates that feeding behavior of different larval instars varied significantly with the age and moulting to the next stage. The third and fourth instar larvae were more voracious feeders than the other instars and there was significant difference between the feeding of different instars. The mean aphid feeding rate of first, second, third

and fourth instar larvae was 17.11, 35.05, 53.61 and 78.77 nymphs /day respectively. After fourth instar they entered pupal stage at 13th day of larval life. There was significant difference between the feeding rate of different instars and between the days of larval life ($P<0.05$).

ii. Adults

The finding indicates the feeding potential of male and female adults of *C. transversalis* on *A. gossypii*. The perusal of data reveals that age of male and females adults on *A. gossypii* was 28 and 32 days respectively. The feeding potential of male was 121.04 nymphs/day for female it was 145.08 nymphs/day. The feeding potential of female adults on *A. gossypii* was more than male adults. There was significant difference in the feeding feeding rate of adult life of male and female ($P<0.05$).

Mustard aphid, *Lipaphis erysimi*

i. Larval instar

The perusal of data shows that the duration of first, second, third and fourth instar larva was 2.0, 3.0, 3.0 and 5.0 days when fed on *L. erysimi*. The feeding behavior of different instars varied significantly with the age and moulting to the next stage. The third and fourth instar larvae were significantly more (voracious) feeders than second and first instar. The mean feeding rate / day / larval of first, second, third and fourth instar was 4.0, 9.34, 17.80 and 31.96 nymphs/day respectively.

ii. Adult

The result further reveals that the feeding duration of male and female adults of *C. transversalis* on *L. erysimi* was 32 and 35 days respectively. The adult males devoured 44.99 nymphs/day and the adults females devoured 56.56 nymphs/day during their adult age. The feeding potential of female adults was significantly more than male adults and there was significant difference in the feeding rate of adult life of males and females ($P<0.05$).

Akk aphid, *Aphis nerii*

i. Larval instar

The feeding behavior and rate of food consumption in different instars varied with the age. There was significant difference between the feeding rate of different instars and between the days of larval life ($P<0.05$). The third and fourth instars were more voracious feeders of *A. nerii* than the other instars. The results indicate that mean feeding rate and percent consumption of aphids per day of first, second, third and fourth instar larva was 5.40, 14.80, 32.70 and 65.03 nymphs/day, respectively.

ii. Adult

The result indicates that the age duration of male adult of *C. transversalis* on *A. nerii* was 36.0 days as compared to female adults (38.0 days). The feeding potential of female adult was 62.93 ± 0.55 nymphs/day as compared to male adults 58.27 ± 2.09 nymphs/day. There was significant difference in the feeding feeding rate of adult male and female ($P<0.05$).

The investigations of George [3], Panda *et al.* [4], Singh *et al.* [5], Moore and Moore [6], showed feeding efficiency of different coccinellid predators against different host species of sucking complex.

CONCLUSION:

It is conclude that this beetle preferred *A. gossypii* as compared to *A. nerii* and *L. erysimi*. The 3rd and fourth instars of beetle were more voracious feeders. Where as aphid consumption was significantly greater in case of female ladybird beetles as compared to males. Transverse beetle adults and larvae lived longer on *A. nerii* followed by *L. erysimi* and *A. gossypii*

. Table.1. Consumption rate by larval instars and Adults of <i>C. transversalis</i> F. on three aphid species in the laboratory at Temp: 26 ± 2 °C, R.H. 65 ± 5 %.				
Life Stages	Prey densities	<i>A. gossypii</i>	<i>L. erysimi</i>	<i>A. nerii</i>
1 st Instar	20	17.11 ± 6.39	4.0 ± 0.37	5.40 ± 0.37
2 nd Instar	40	35.05 ± 6.36	9.34 ± 0.72	14.80 ± 0.55
3 rd Instar	70	53.61 ± 8.10	17.80 ± 0.79	32.70 ± 0.84
4 th Instar	90	78.77 ± 10.66	31.96 ± 1.13	65.03 ± 1.67
Male	150	121.04 ± 1.37	42.99 ± 0.41	58.27 ± 0.64
Female	150	145.08 ± 0.80	56.56 ± 0.53	62.93 ± 0.55
Table.2. Developmental period (days) of larval instars and Adults of <i>C. transversalis</i> F. on different aphid species in the laboratory at Temp: 26 ± 2 °C, R.H. 65 ± 5 %.				
Predator developmental Stages	<i>A. gossypii</i>	<i>L. erysimi</i>	<i>A. nerii</i>	
1 st Instar	3	2	3	
2 nd Instar	2	3	3	
3 rd Instar	3	3	4	
4 th Instar	5	5	6	
Male	28	32	36	
Female	32	35	38	

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