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Research Article

Feeding Preference of Larvae and Adults of Zigzag Beetle on Sucking Insect Pests of Brinjal Under Lab. Condition at Tando Jam

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Abstract

Study was carried out on Feeding Preference of Larvae and Adults of Zigzag Beetle on Sucking Insect Pests of Brinjal Under Laboratory Conditions in 2013 at Tando Jam. Observations on feeding preference of Zigzag beetle shows that the highest feeding consumption of first instar larvae of Zigzag beetle were consumed 9.28±1.47aphids/day. Similarly, on whiteflies the feeding rate was 7.56±1.05, and on thrips 5.28±0.98. The mean highest consumption of 1st instar was recorded on aphids, and lowest on. Similarly, in the second instar larva the mean highest consumption rate during 24 hours was recorded on aphids. 19.21±1.97 / day followed by whiteflies 13.39±2.82/day and thrips 10.36±1.89/day. In case of third instar larvae the maximum feeding rate was recorded on aphids 35.26±2.06/day followed by whiteflies. 23.15±2.45/day and thrips 16.36±3.82/day. The fourth instar larvae of Zigzag beetle were consumed 52.69±3.89aphids/day followed by whiteflies 39.64±3.02/day and thrips 26.85±5.56/day. While the feeding preference rate of both male and female adults of Zigzag beetle also observed. The male adults of Zigzag beetle were 61.17±4.67 aphids/ day. On whiteflies was 42.89±4.12. Similarly, on thrips was 32.56±6.26 thrips/ day. The mean aphid consumption by female adults was more on aphids 72.34±5.33 / day followed by whiteflies 47.23±4.93/day and thrips 37.89±7.19/day. The overall data indicated that fourth instar larvae of Zigzag beetle was more voracious feeder of different sucking insect pests of brinjal as compare to 1st, 2nd and 3rd instar larvae and female adults of Zigzag beetle consumed more sucking pests of brinjal than male adults. However, there is no significant difference between both sexes. The data reveals that aphids was most preferred food and thrips was least preferred prey for Zigzag beetle.

Keywords: Feeding preference; zigzag beetle; sucking pest; pest consumption; brinjal.

Introduction

Insect pests have always been a threat to agricultural productivity, so crop productivity per unit area in Pakistan is much lower than potential crop yields or compared to production in advanced agricultural countries. The major pests include eggplant, cotton and okra fruit and shoot borer, leafhopper, whitefly, thrips, aphid, spotted beetles, leaf roller, stem borer, blister beetle, red spider mite, and little leaf disease. Therefore, in order to control these harmful insects, different chemicals (insecticides) are applied to different pests (Soni *et al*., 2004). Biological control is the use of organisms to reduce the population density of another organism, including the control of pests, weeds and diseases. First, in nature, most organisms are consumed by carnivores, which in many cases leads to a sharp reduction in prey populations; in biological control, humans use this "natural control" to suppress the number of pest species. Second, biological control reduces, rather than eradicates, pests,

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allowing pests and natural enemies to remain in agro-ecosystems at low density (Joshi and Sharma, 2008). Coccinellid beetles are widely distributed throughout the world and are found in a wide variety of trees, shrubs, weeds, grasses and cultivated crops. The Coccinellid beetle represents one of the most beneficial and recognizable insect populations known to man. For most species, adults and larvae are adults predators of various prey, including mites, thrips, lizards, mites, whiteflies, mites and moth eggs (Solangi, 2004). Coccinellids are predators of various pests, namely aphids, whiteflies, ticks, scales, whiteflies, mites and other soft insects (Joshi and Sharma, 2008). In view of the importance of zigzag beetles in the biological control of aphids, whiteflies and thrips. The Zigzag beetle likes three different eggplant sucking pests as a dietary check under laboratory conditions.

Material and Methods

The current research work is the "Feeding Preference of Larvae and Adults of Zigzag Beetle on Sucking Insect Pests of Brinjal Under Laboratory Conditions in 2013 at Tando Jam." was conducted in the laboratory, Department of Entomology, Sindh Agriculture University, Tando Jam during 2013.

Culture Development

Adult beetles of predator, zigzag beetles and host aphids, whiteflies and thrips, collected from eggplant, cotton and other crops. Adult beetles were brought to the laboratory and confined in cube plastic cages (25" x 10" x 15"). One side of the cage was secured with a wire mesh, and each cage had an operator/observer hole in front of it. Protected by a fine cloth cover to provide food for predators. Fresh young leaves of various hosts containing aphids, whiteflies and thrips (prey) are provided daily to adult beetles.

Life Cycle Development

Eggs:

Eggs deposited mainly on the leaves of the host plants were removed daily and held in pairs of petri dishes (9 cm in diameter) with the help of a camel brush, and the filter paper was spread at the bottom. The number of eggs laid by each female in each dish was counted under a binocular microscope. This process is repeated until the female of the spawning die. Each experiment was repeated ten times. The laboratory temperature of 25+2 ^{0}C and at 60 to 70% R.H was made.

Larval instars:

After hatching the eggs, the duration of the larval stage was determined by placing each larva in a petri dish equipped with aphids, whiteflies and thrips and repeating 10 times.

Pupal and adult stages:

The pupal stages were observed by placing 4th instars larva in Petri dishes (9.0×1.5 cm). The newly emerged adults were sexed and replaced in Petri dishes by placing a male and female pair in each Petri dish and replicated 10 times. Adults were provided with counted aphids, whiteflies and thrips on fresh leaves of brinjal.

Mating behaviour of adult:

Newly emerged both male and female adults were released in glass bowls (7 cm ×2.5 cm) in pairs to record the mating behavior. The number of eggs (fecundity) lay by each female during her life time, incubation period of eggs, hatching percentage of eggs and mortality were recorded.

Feeding preference of Zigzag beetle in laboratory Larval (grub) instars:

After hatching from the eggs, the first instar larvae of the zigzag beetle were transferred to a Petri dish (9 cm in diameter) by a camel hair brush. The 1st, 2nd, 3rd and 4th instar larvae used to record feeding preferences provided 30, 60, 90 and 150, aphids, whiteflies and thrips, and leaves of eggplant crops and were repeated 5 times. The consumption of aphids, whiteflies and thrips of each aphid was observed 24 hours a day until the grub entered the next developmental stage. The experiment continued until the predator's pupation.

Adults:

Newly emerging Zigzag beetle adults were randomly collected from laboratory cultures. Male and female adults were kept in separate petri dishes, providing 250 adult mites, whiteflies and thrips for each adult beetle. The consumption of aphids, whiteflies and thrips was recorded 24 hours a day. This experiment was repeated five times.

Results

Feeding preference (1st, 2nd, 3rd and 4th larval instars) of Zigzag beetle (during 24 hours) on different sucking insect pests of brinjal: The data (Table 1) shows the feeding preferences of the (24 hours) Zigzag beetle larvae for different sucking insect pests of brinjal. The results showed that the first instar larvae of the Zigzag beetle consumed 9.28±1.47aphids/day. Similarly, the feeding rate for whiteflies was 7.56±1.05, and the feeding rate for thrips was 5.28±0.98. The mean highest consumption of 1st instar was recorded on aphids, and lowest on. Similarly, in the second instar larva the mean highest consumption rate during 24 hours was recorded on aphids 19.21±1.97/day followed by whiteflies 13.39±2.82/day and thrips 10.36±1.89/day. In the case of third-instar larvae, the maximum feeding rate was recorded on aphids 35.26±2.06/day followed by whitefly 23.15±2.45/day and thrips 16.36±3.82/day. The Zigzag beetle's fourth instar larvae consumed 52.69±3.89aphids/day, followed by whitefly 39.64±3.02/day and thrips 26.85±5.56/day. The results showed that the fourth instar larvae of the zigzag beetle were more voracious than first, the second, and third instar larvae.

Table 1: Mean host consumption of 1st, 2nd, 3rd, & 4th instars grub of Zigzag beetle on different sucking insect pests of brinjal in laboratory.

Hosts	Host consumption per (24 hours) (Mean ± S.E)			
	1st instar	2nd instar	3rd instar	4th instar
Aphids	9.28±1.47	19.21±1.97	35.26±2.06	52.69±3.89
Whiteflies	7.56±1.05	13.39±2.82	23.15±2.45	39.64±3.02
Thrips	5.28±0.98	10.36±1.89	16.36±3.82	26.85±5.56

Table 2: Mean host consumption of adult males and females of Zigzag beetle on different sucking insect pests of brinjal in laboratory.

Hosts	Host consumption per (24 hours) (Mean ± S.E)	
	Male	Female
Aphids	61.17±4.67	72.34±5.33
Whiteflies	42.89±4.12	47.23±4.93
Thrips	32.56±6.26	37.89±7.19

Feeding Preference Adults (Male and Female) of Zigzag Beetle (During 24 Hours) on Different Prey Aphid Species.

Male adults:

The data presented in (Table-2) indicate that the average feeding rate of male adults of the zigzag beetle of different host species varies with the age of the male adult. The results showed that the consumption rate on aphids was 36 days, and it devoured mean 61.17±4.67aphids per day. On whiteflies the longevity of male adult was 30 days and whiteflies consumption per day was 42.89±4.12. Similarly, on thrips, the male adult has a lifespan of 28 days and it devoured 32.56 ± 6.26 thrips/day. The data shows that aphids are the favorite food, and the thrips are the least favorite prey for male adults of the Zigzag beetle.

Female adults:

The results in (Table-2) indicate that the average aphid consumption of female adults is more from aphids 72.34±5.33/day, followed by whitefly 47.23±4.93/day and thrips 37.89 ±7.19/day. Overall data shows that female adults consume more eggplant sucking pests than male adults of the Zigzag beetle. However, there is no significant difference between the sexes.

Discussion

This experiment was designed to a study the Feeding Preference of Larvae and Adults of Zigzag Beetle on Sucking Insect Pests of Brinjal Under Laboratory Conditions in 2013 at Tando Jam. Aphid, whitefly and thrip are the sucking pests which damage the plants by sucking the saps. For the management of these pests' biological control is the best way, so the biology of Zigzag beetles was necessary to know the breeding information of predators on studied sucking pests. It was observed from the results of thr current research indicates that pre-mating, mating duration, mating days, spawning days, and days after spawning vary considerably in the replication/pairing of ladybird beetles. Similarly, fecundity, fertility, and within zigzag beetle pairs deviation situation was considerable. During the incubation period, the duration of the 1st, 2nd, 3rd and 4th instars was relatively similar, while the duration of the pupal stage was longer. Compared with males, female zigzag beetles have more adults, so females have a higher sex ratio than males. The present study agrees with those Bhadauria *et al*., (2001) studied lifecycle of *Menochilus sexmaculatus* on the five species of the aphid's species *Lipaphis erysimi* (Kalt.), *Aphis craccivora* (Koch). *Hyadaphis coriandri* (DAS), *Aphis nerii* (BLF) and *Uroleucon compositae* (Theobald). *U. compositae* hinders the development of larvae of predators, and adults transformed from larvae feeding on *U. compositae* fail to produce nymphs. A. nerri is the most suitable host. The fecundity of feeding adult worms is higher than that of nymphs. The consumption of *H. coriandri* nymphs is greatest during larval development and lowest in *U. compositae*. The present study also partially agrees with Ali *et al.* (2005) the predation potential of *Coccinella undecimpunctata* on *Aphis gossypii* was evaluated under laboratory conditions. On the 1st, 2nd day, adults and adults of the 3rd and 4th instar larvae provided aphids on cotton leaves. Except for the 2nd and 3rd instar, the predation potential and the aphid mortality caused by larval damage significantly changed during the larvae, and there was no significant change in both parameters. The number of aphids consumed by each larva increased as the larva

agreed, while the fourth instar larva recorded the greatest predation potential (21.28 aphids per larva). The mortality of mites caused by larval damage decreased with increasing larval age and the highest mortality rate for first-instar larvae (15.87%). The present study also in agreement with those Solangi *et al*., (2007) studied the biological characteristics of 11 species of spotted beetle *Coccinella undecimpunctata* L. in 2006 mustard were studied. The spawning, fecundity, adult emergence rate, fertility %, sex ratio, life longevity and mortality of 10 pairs of individually reared beetles were studied in the laboratory. The results showed that the average mating period before mating was 4.1±1.28 days, the post mating period was 3.6±1.26 days, the spawning period was 37.7±6.88 days, and the post spawning period was 4.0±1.63 days. The average fecundity was 593.4±86.5 eggs, the fertilized eggs were 531.80±76.16, and the fertility rate was 89.63±3.44. The incubation period was 3.1±1.19 and 3.1±0.94 days, while the first and second instar larvae were 3.1±1.19 and 3.1±0.87 days, respectively, and the 3rd and 4th instar larvae averaged 3.5±1.26 and 3.3±0.94 days, respectively. The total larval period was 12.9±1.28 days, and the pupal period was 5.6±0.96 days. The average number of pupae observed was 19.9 ± 6.69, while male emergence was 7.4 ± 2.63 (38.50 ± 13.12%) and female emergence was 8.9 ± 3.66 (43.48 ± 8.24%). The sex ratio (male: female) averaged 1:1.25 ± 1:0.45. Therefore, the total male + female appearance of each beetle pair was 81.99 ± 13.37. The recorded mortality was 3.7 ± 3.43 beetles and the average mortality was 17.57 ± 14.51%. Compared with males, female adults of the 11-spot beetle appeared more, so the female sex ratio was higher than that of the male.

Conclusion

The duration of pre-mating, mating and post mating, spawning and post spawning days of Zigzag beetle was varied on different sucking insect pests of brinjal.

The egg incubation period and duration of 1st, 2nd, 3rd and 4th instars also different on different sucking insect pests of brinjal. Adult emergence was greater in female beetles as compared to males and thus the sex ratio was higher in females as compared to males on different sucking insect pests of brinjal.

3rd and 4th instars are voracious feeders as compared to 1st and 2nd instars. Adult female consumed a greater number of different sucking insect pests of brinjal as compared to males.

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