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Voracity of Coccinellid Predator, *Brumus Suturalis* Fabricius (Coleoptera: Coccinellidae) on Cotton Spider Mite, *Tetranychus Urticae* (Koch) *(*Acari: Tetranychidae*)* in Laboratory and Field

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Abstract:

An experiment was conducted to determine the voracity of lady bird beetle, Brumus suturalis Fabricius (Coleoptera: Coccinellidae) on cotton mite, Tetranychus urticae (Koch) (Acari: Tetranychidae) in the laboratory and field. The laboratory results revealed that B. suturalis was voracious feeder of cotton mite. The fourth instar devoured maximum mean number (40.5±0.83) of mites /day/larva followed by third (32.7±1.4), second (25.0±1.7) and first instar (12.2±0.9) and the adult females devoured more number of mites (59.41±0.84) than male (56.65±1.04) per day under laboratory conditions (26±2°C). The field results showed that, fourth instar devoured more mean number

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(23.6±0.93) of mites/day/larva followed by third (20.66±1.17), second (14.86±0.99) and first instar (10.17±0.8) and the adult females devoured more mean number (39.42±0.69) than male (34.33±0.9) mites per day.

Key words: voracity, predator, Ladybird beetle, Cotton mite, Laboratory, field

Introduction

Spider mite, (*Tetranychus urticae*) belongs to the family Tetranychidae and is serious pest of cotton, field crops and vegetables in Pakistan (Lohar, 2001). The adult female two-spotted spider mite has a straw yellow to green colour with two dark spots on both sides of the body. Young individuals are similar in appearance to the adults (Jeppson *et al.* 1975). The females lay more than 100 eggs. The damage occurs on the under surface of the leaves but can be seen from above as pale areas. Severely damaged plants turn pale yellow and may be covered by webbing produced by the mites. The damage can result in defoliation and even death of the plant (Shih *et. al.*1976). Mite infestation may appear any time from June to September if the weather is continuously dry and mite suck the sap and form a web, because of which dust accumulates on the under surface of the leaves affecting the photo synthetic activity. The leaves, squares, flower and bolls shed of when the population is high if infestation is allowed to persistent damage may be a high 75% (Bhatti *et al.* 1996).

Biological control is a component of an integrated pest management strategy. It is defined as the reduction of pest populations by natural enemies (Parasitoids and predators). These are primarily regulating force in the dynamics of the populations (Shepard, 1999). The aim of this study was to

confirm the voracity and the predation efficiency of a *B. suturalis* stages on cotton mite.

Materials and Methods

Voracity and Development Period of B. suturalis Reared on T.urticae in Laboratory

The feeding rate of larval instars and adults (male and female) of *B. suturalis* on *T. urticae* was determined under lab conditions at 26±2ºC and 68±5% R.H. during August and September 2007. The field collected mites were mass cultured in laboratory for providing to the predator for experimentation.

Feeding Capability of Larval Instars in laboratory

After releasing the mites in sterilized Petri dishes (9 cm. dia.) the different larval instars of *B. suturalis* were transferred into Petri dishes with the help of camel hairbrush. Before releasing larvae into Petri dishes they were kept for 2 hrs without food. In order to check feeding ability, a single larva per petri dish was provided with counted number of mites (on daily basis) along with the field collected leaves of cotton plant. The mites were collected from the susceptible varieties of cotton from the field. The experiment was laid down in 5 replications. The mite consumption by each larval instar i.e., 1st, 2nd, 3rd and 4th, was counted after 24 hours interval till the larvae transformed into subsequent life stage.

Feeding Ability of Adults in Laboratory

The newly emerged (24 hours old) adults male and female of *B. suturalis* were kept separate in Petri dishes (9 cm. dia.). Different counted numbers of mite were provided to them. There were five replications for each sex. The number consumed by each male and female were recorded at 24 hours interval until the death of each sex.

Voracity and Development Period of B. suturalis Reared on T. urticae in Field

Feeding preference of larval instars and adults (male and female) of *B. suturalis* was also determined in field condition. For this purpose, a half acre field of cotton crop was selected. The experiment was conducted when mean temperature and relative humidity percent were 25±2°C and 68±5% respectively.

Voracity of Larval Instars in Field

The one cotton plant was grown in field in each pot. These plant pots were then shifted in the wooden cages (2x2x4ft.) in cotton field. The cages were covered with iron net round. The cages were kept in the cotton field at 5 feet distance of each cage. The experiment was laid down in five replications. The different counted number of mites was released onto them. The laboratory reared 1st, 2nd, 3rd, and 4th instars larvae of *B. suturalis* each one was released on caged plants. The mite consumption of each larval instar was recorded at 24 hours intervals. This procedure was repeated until the larva changed into to its subsequent life stage.

Voracity of Adults in Field

Newly emerged (24 hours old) adults, male and female of *B. suturalis* were kept separate in cages (2x2x4 ft.) in the cotton field. The procedure was same as in voracity of larval instars. The cages were kept in the cotton field at 5 feet distances. The experiment was laid down in five replications. The different counted number of mites was released onto them. The laboratory reared adult male and female of *B. suturalis* each one was released on caged plants. The mite consumption of male and female were recorded at 24 hours interval. This procedure was repeated until the death of adults. The experimental data were analyzed using the statistical package Student Statistic 1.8.

Results and Discussion

Voracity of B. suturalis Reared on Cotton Mite, T. urticae in Laboratory

Voracity of Larval Instars:

The results in (Fig. 1) represents the comparative feeding rate and development period (days) of different larval instars and adults of *B. suturalis* reared on cotton mite, during August to September 2007 in laboratory at (26 ± 2^{0}C) and R.H. (65±5%). The data revealed that feeding behaviour of different larval instars varied significantly. The feeding rate of larval instars was increased with age and as they underwent successive molting to the next instar. All larval instars of *B. suturalis* were voracious feeders, however the fourth instar devoured more number of mites/day/larva of (40.5±0.83) followed by third instar (32.7±1.4), second instar (25.0±1.7) and first instar (12.2±0.9). The data in (Fig. 2) also indicated that first instar consumed (36.6±0.35) mite, second instar (50.0±1.20), third instar (78.1±1.23) and fourth instar (160.0±3.35) mites per stage/larva. The consumption rate of different larval instar indicated that fourth instar consumed more number of mites compared to other instars. Similar results were reported earlier Zadeh and Pormirza (1999) studied the feeding rate of different life stages of lady bird beetle, *S. punctillum* on the red spider mite and observed that first, second, third and fourth instars insect consumed, 6.8±0.7, 23.5±2.4, 37.3±4.5, 92.9±4.6 and 211±5.2 mites respectively per day. Ragkou *et al.* (2004) conducted laboratory experiments on daily consumption and predation rate of Coccinellid predator, *S. punctillum* instars feeding on *T. urticae* and reported that the first instars larva consumed (16.67, 18.56, 19.56 and 14.33) egg, larva, nymph and adult respectively, of the prey *T. urticae*.

Voracity of Adults

The data in (Fig.1) further shows that the voracity of adult male and female of *B. suturalis* on mites in laboratory under similar conditions. The perusal of data shows that adult male devoured (56.65±1.04 mites per day) as compared to adult female (59.41±0.84 mites/day). The data shows that adult female consumed more mites. It could therefore be inferred that like other Coccinellid beetles, the feeding potential of female adults of *B. suturalis* were more than males. The data in (Fig. 2) on feeding rate of adults indicates that the male adult devoured (1756.2±32.4) mites per stage as compared to female adult (1960.7±27.8 mites /stage). David (2009) reported that ladybird beetles are the natural killer of pest mites. The adult ladybird beetle can live for over a year and eat up to nine mites an hour or (75 to 100 mites) a day. Hodek and Honek (1996) reported that the amount of food consumed is strongly determined by predator body size. Parvin *et al.* (2010) reported that three predators i.e., *Phytoseiulus persimilis*, *Stethorus punctillum* and *Scolothrips sexmaculatus* are effective predators of *T. urticae* and may be used as bio-control agents against two-spotted spider mite.

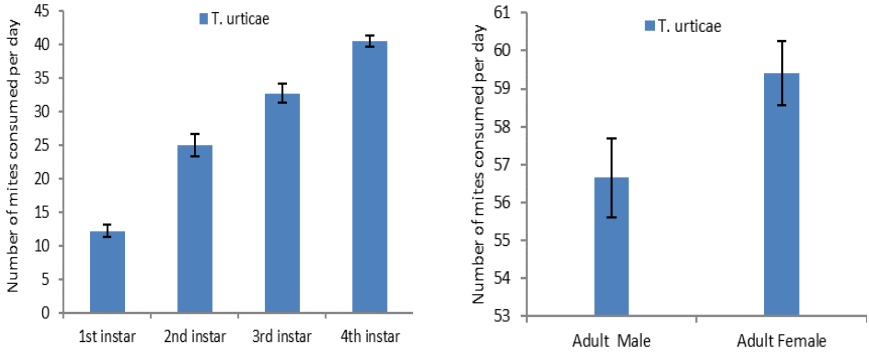

Fig. 1 Feeding potential (per day) of larval and adult stages of *B. suturalis* on *Tetranychus urticae* in Laboratory.

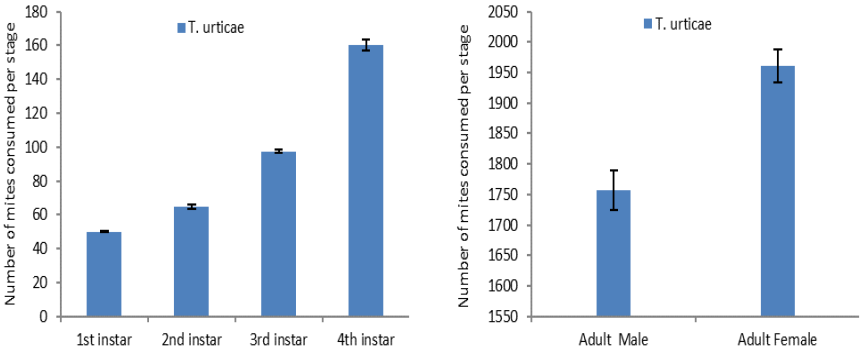

Fig. 2 Feeding potential (per stage) of larval and adult stages of *B. suturalis* on *Tetranychus urticae* in Laboratory.

Voracity of B. suturalis Reared on T. urticae in Field

Voracity of Larval Instars

The data in (Fig. 3) represents the comparative feeding rate and developmental period of different larval instars and adults of *B. suturalis* reared on cotton mite, during July and August, 2007 in field at (28 ± 2^0C and R.H. 68 ± 5%). The data revealed that feeding behavior of different larval instars varied significantly. The feeding rate of larval instars was increased with age and as they underwent successive molting to the next instars. All larval instars of *B. suturalis* were voracious feeders, however the fourth instars devoured more number of mite/day/larva of (23.6±0.93) followed by third instars (20.66±1.17), second instars (14.86±0.99) and first instars (10.17±0.8 mite/larva/day). The data in (Fig.3) indicates the feeding rate of different larval instars. The first instars consumed (30.53±2.40) mites, second instars (44.58±2.98), third instars (62±3.51) and fourth instars (94.4±3.75) per stage/larva.

The consumption rate of different larval instar indicates that fourth instar consumed more mites compared to other instars. Khuhro *et al*., (2008) reported that the 3rd and 4th instars larvae of *Brumus suturalis* were more voracious as compare to 1st and 2nd instars.

Voracity of Adults

The results in (Fig. 3) further shows the feeding potential of adult male and female of *B. suturalis* on mite in field under similar conditions. The perusal of data shows the adult male devoured 34.33±0.9mites per day as compared to adult female (39.42±0.69). It could be inferred that like other Coccinellid beetles, the feeding potential of female adults of *B. suturalis* were more than males. The data in (Fig. 3) on feeding rate of adults indicates that the male adult devoured 1132.9±29.7 mites per stage as compared to female adult (1380.4±24.3). Zadeh and Pormirza (1999) studied the voracity rate of *S. punctillum* on the red spider mite and observed that adult insect consumed (211±5.2) mites per day. The present results also agree with Parvin *et al*. (2010) who reported that adult female lady bird beetle, *S. punctillum* is more voracious than other stages and consumed (70.89 ± 2.69) eggs per day.

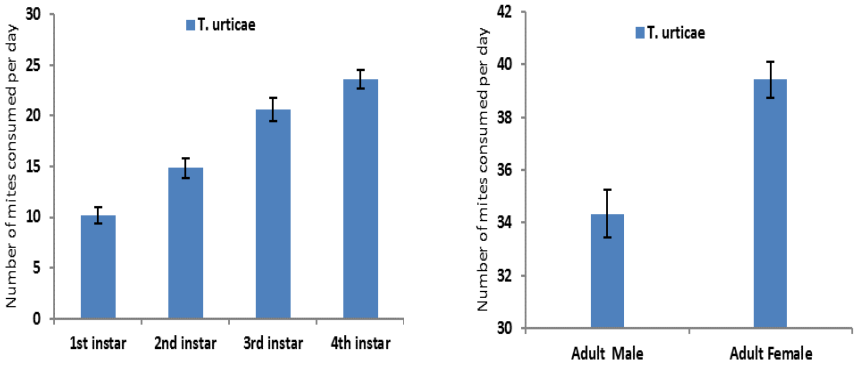

Fig. 3 Feeding potential (per day) of larval and adult stages of *B. suturalis* on *Tetranychus urticae* in Laboratory.

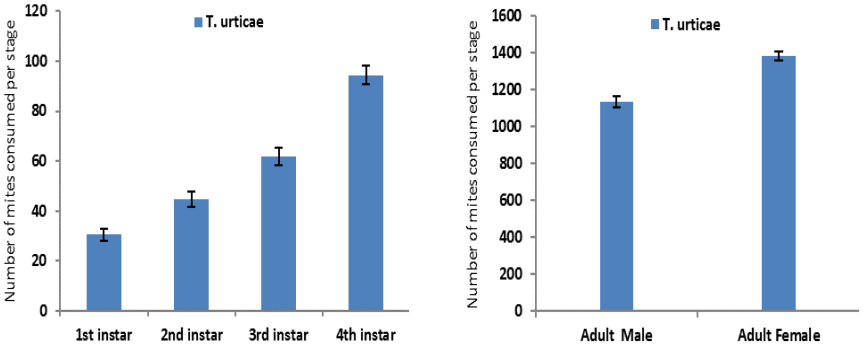

Fig. 4 Feeding potential (per stage) of larval and adult stages of *B. suturalis* on *Tetranychus urticae* in Laboratory.

Conclusion

On the basis of present studies, that both adults and larvae of predatory beetle prefer the mites. The larvae 3rd and 4th instars of *B. suturalis* were found more voracious as compared to 1st and 2nd instars. Adult female consumed more number of mites as compared to adult male.

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