EUROPEAN ACADEMIC RESEARCH
Vol. II, Issue 7/ October 2014

Impact Factor: 3.1 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Feeding Ability of Brumus Suturalis Fabricius (Coleoptera: Coccinellidae) on Cotton Whitefly, Bemisia Tabaci (Gennadius) (Homoptera: Aleyrodidae)

SHAH NAWAZ KHUHRO[1]
ALI MUHAMMAD KALROO
FARHAN AHMAD
Pakistan Central Cotton Committee's Central Cotton Research Institute
Sakrand, Sindh
Pakistan
MUHAMMAD KHAN LOHAR
ASLAM BUKERO
Sindh Agriculture University Tandojam, Sindh
Pakistan
MUSHTAQUE ALI LAGHARI
Pakistan Central Cotton Committee's Central Cotton Research Institute
Sakrand, Sindh
Pakistan

Abstract:

The predator, Brumus suturalis (Fab.) is the generalist predator, during checking the feeding ability it was found the voracious predator of whitefly on cotton in Sindh-Pakistan. A research was conducted to determine the feeding ability of this predator on Cotton Whitefly, Bemisia Tabaci (Gennadius) (Homoptera: Aleyrodidae) in Laboratory and Field. The laboratory results revealed that B. suturalis was voracious feeder of cotton whitefly. The fourth instar devoured maximum mean number (72.22 ± 2.75) of whiteflies /day/larva followed by third (61.91 ± 2.59), second (24.88 ± 0.44) and first instar (12.38 ± 0.56) and the adult females devoured more number of whiteflies (149.37 ± 8.26) than male (118.48 ± 7.41) per day under laboratory conditions (26±2°C). The field results revealed that, fourth instar devoured more mean number (12.46 ± 0.64) of

whiteflies/day/larva followed by third (11.47 ± 0.42), second (7.50 ± 0.45) and first instar (3.60 ± 0.29) and the adult females consumed more mean number (14.93 ± 0.83) than male (14.60 ± 0.32) whiteflies per day.

Key words: Feeding ability, predator, Coccinellid beetle, **c**otton whitefly and laboratory

Introduction

Cotton is the fiber and one of the most important cash crops of the Pakistan. It contributes about 68% to the foreign exchange earning of our country (Khan and Khan, 1995). Pakistan ranks 4th as a grower and 3rd as an exporter of raw cotton in the World (Ahmad, 1999), Unfortunately, still its lint yield is very low as compared to other major cotton growing countries of the world. Many factors are responsible towards low yield, among them the heavy attack of sucking insect pest complex. In sucking insect pest whitefly, *Bemisia tabaci* (G.) is the most injurious pest of cotton crop. It is a widely distributed pest species colonizing many agricultural systems including greenhouses in both the tropics and subtropics (Oliveira *et al.* 2001). It damages the plants in different ways i.e. nymphal and adults of the insect suck the cell sap from the leaves. Sooty mould develops on the sticky material secreted by the insect which disturbs the photosynthesis of the plants (Attique *et al.*, 2003). It also acts as a vector of about 38 plant diseases (Hussain *et al.* 1991). Whiteflies occurs at all the stages of the crop growth and responsible for indirect yield losses. Since, these pests suck the sap from the plants which leads to reduction in growth and vigor of the plants. In severe case of

[1] Corresponding author: snkhuhro@gmail.com

infestation, the plants get dried up and eventually die (Arif *et al.*, 2006; Chaudhari *et al*., 1999).

The farmers are facing problems regarding control of whitefly on cotton crop in Pakistan. There are different whitefly control tactics; among these tactics developing of bio-control strategy information regarding the whitefly control in cotton is needed. 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). In order to understand the predatory efficiency of Coccinellid predator, *B. suturalis* belonging to the family Coccinellidae order Coleoptera on *B. tabaci* was evaluated in a laboratory and field. Practical recommendations could be made on the basis of results for use of three striped predatory beetle, *B. suturalis* against the control of whitefly in the cotton crop.

Materials and Methods

Feeding ability of B. suturalis Reared on B. tabaci in Laboratory

The consumption rate of larval instars and adults (male and female) of *B. suturalis* on *B. tabaci* was determined under laboratory conditions at 26±2ºC and 68±5% R.H. during August and September 2008. Whiteflies were collected and mass cultured in laboratory for offering to the predator.

Feeding ability and development of Larval Instars in laboratory

Whiteflies were released in sterilized Petri dishes (9 cm. dia.) then different stages of larval instars of *B. suturalis* were moved into Petri dishes with the help of camel hairbrush. Before releasing larvae into Petri dishes, predator stages were

kept for 2 hours without food. In order to check feeding ability, a single larva per petri dish was provided on daily basis with counted number of whiteflies along with the field collected leaves of cotton plant. The whiteflies were collected from the vulnerable varieties of cotton from the cotton field. The experiment was laid down in 5 replications. The whitefly consumption by each larval instar i.e., 1st, 2nd, 3rd and 4th, was counted after 24 hours interval till the larvae transformed into following life stage.

Feeding Ability of Adults in Laboratory

Adults male and female of *B. suturalis* (The newly emerged 24 hours old) were kept separate in Petri dishes (9 cm. dia.). Different counted numbers of cotton whitefly were provided to them. There were five replications for each sex. Consumed number of whiteflies by each male and female were noted at 24 hours interval until the end day of each sex.

Feeding ability and Development Period of B. suturalis Reared on B. tabaci in Field

Feeding ability 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.

Feeding ability of Larval Instars

The earthen pots were purchased from the local market and plants were sown for experiment. In each pot one cotton plant was grown. After grown the plants in pots were then shifted in the wooden cages (2x2x4ft.) in cotton field. The cages were covered with iron net round. The cages were shifted in the cotton field at 5 feet distance of each cage. Five replications were kept for the experiments. The different counted number of

whiteflies 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 whitefly 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.

Feeding ability of Adults

In laboratory reared 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 feeding ability of larval instars. The experiment was laid down in five replications. The different counted number of whiteflies was released onto them. The cages were kept in the cotton field at 5 feet distances. The laboratory reared adult male and female of *B. suturalis* each one was released on caged plants. The whitefly 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

Feeding ability of B. suturalis Reared on Cotton Whitefly, B. tabaci in Laboratory.

Feeding ability of Larval Instars:

The data in (Fig. 1) indicates the feeding ability of different larval instars and adults of *B. suturalis* reared on cotton whitefly, during August to September 2008 in laboratory at (27 ± 2^0C) and R.H. (65±5%). The results revealed that feeding ability of various larval instars varied significantly. The consumption 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 consumed more number of whiteflies/day/larva of (72.22 ± 2.75) followed by third instar (61.91 ± 2.59), second instar (24.88 ± 0.44) and first instar (12.38 ± 0.56). The results in (Fig. 2) also revealed that first instar consumed (37.16 ± 1.70) whitefly, second instar (74.66 ± 1.21), third instar (216.65 ± 8.26) and fourth instar (247.65 ± 10.36) whiteflies per stage/larva. The consumption rate of different larval instar indicated that fourth instar consumed more number of whitefly as compared to other instars.

Feeding ability of Adults

The results in (Fig.1) shows that the feeding ability of adult male and female of *B. suturalis* on whiteflies in laboratory under similar conditions. The perusal of data shows that adult male consumed (118.48 ± 7.41 whiteflies per day) as compared to adult female (149.37 ± 8.26 whiteflies/day). The results show that more whiteflies were consumed by adult female. The data in (Fig. 2) indicates that feeding rate of adult male devoured (3554.40 ± 20.06) whiteflies per stage as compared to female adult (5078 ± 28.0 whiteflies /stage).

The management by predators of whiteflies as cotton pests in Sindh-Pakistan has not been considered of major importance. However, cotton yield loss due to whitefly transmitted viruses has necessary the development of suitable control methods for whiteflies. Currently, there is limited information on the occurrence, distribution and predation potential on whitefly by *B. suturalis* in cotton in Pakistan. In this study investigated the feeding potential of three striped beetle as a predator of cotton whiteflies. Similar results were reported earlier Kapadia and Puri (1992) observed a Coccinellid predator, *Serangium* spp. feeding on *B. tabaci* on cotton. The results of another study on prey consumption by Legaspi *et al.* (1996) showed that both larvae and adults of coccinellid

predator, *Serangium parcesetosum* are voracious feeders of immature whiteflies. 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. Gautam and Tesfaye (2002) investigated that the feeding potential of female was greater than male.

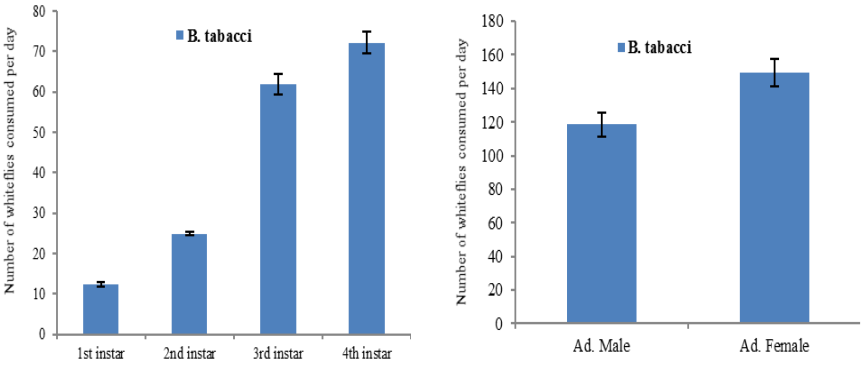

Fig. 1 Feeding ability (per day) of larval and adult stages of *B. suturalis* on *Bemisia tabaci* in Laboratory.

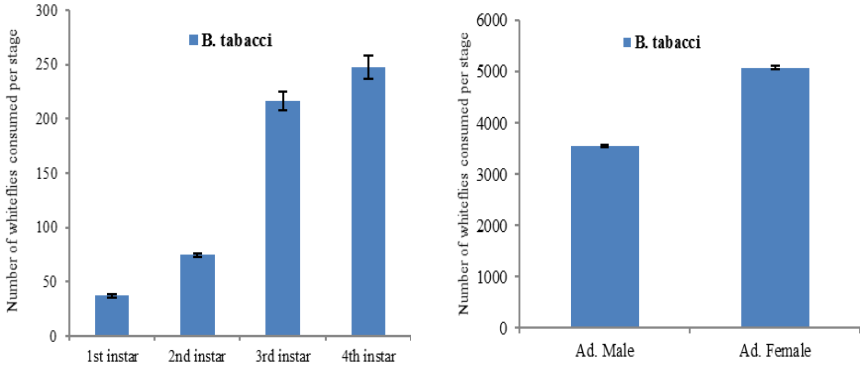

Fig. 2 Feeding ability (per stage) of larval and adult stages of *B. suturalis* on *Bemisia tabaci* in Laboratory.

Voracity of B. suturalis Reared on B. tabaci in Field

Voracity of Larval Instars

The results in (Fig. 3) reveals the comparative feeding rate and developmental period of different larval instars and adults of *B. suturalis* reared on cotton whitefly, during July and August, 2008 in field at (28 ± 2^{0}C and R.H. 68 ± 5%). All larval instars of *B. suturalis* were voracious feeders, however the fourth instars devoured more number of whitefly/day/larva of (12.46 ± 0.64) followed by third instars (11.47 ± 0.42), second instars (7.50 ± 0.45) and first instars (3.60 ± 0.29 whitefly/larva/day). The data in (Fig.3) indicates the feeding rate of different larval instars. The first instars consumed (7.2 ± 0.58) whiteflies, second instars (15.0 ± 0.09), third instars (34.41 ± 0.84) and fourth instars (43.8 ± 0.96) per stage/larva. The consumption rate of different larval instar indicates that fourth instar consumed more whiteflies compared to other instars.

Voracity of Adults

The results in (Fig. 3) further shows the feeding potential of adult male and female of *B. suturalis* on whitefly in field under similar conditions. The perusal of data shows the adult male devoured 14.60 ± 0.32 whiteflies per day as compared to adult female (14.93 ± 0.83). 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 386.26 ± 14.26 whiteflies per stage as compared to female adult (477.76 ± 26.56). The close results were agreed by Saikia and Balasubramanian (2002) who stated that the predatory potential of the female beetle was higher on mealybug when compared to the male adult. However, Hodek and Honek (1996) reported that the amount of food consumed was strongly determined by predator size. The present study further

revealed that the female adults devoured (149.37 whiteflies/adult/day) as compared to male adults (118.48 whiteflies/adult/days). Similarly, Lohar and Khuhro (2005) reported that the larval instars and adults of *B. suturalis* consumed significantly more to *A. devastans* in the laboratory than in the field.

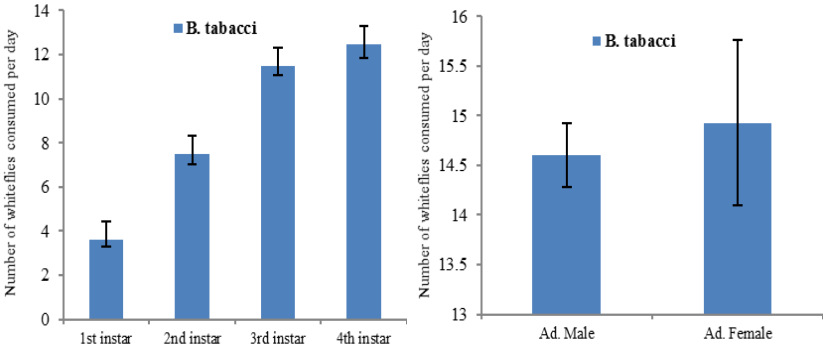

Fig. 3 Feeding ability (per day) of larval and adult stages of *B. suturalis* on *Bemisia tabaci* in Field.

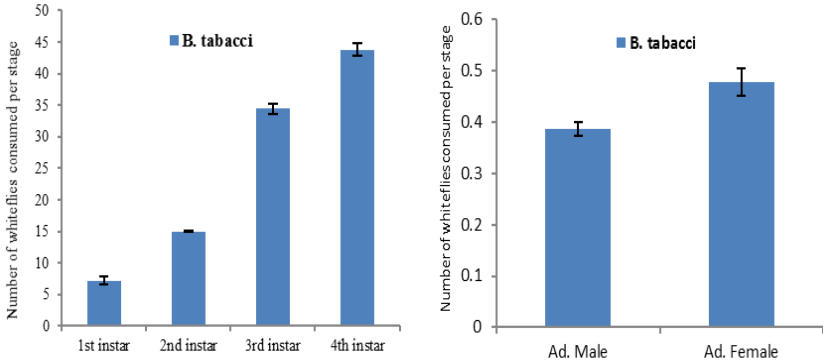

Fig. 4 Feeding ability (per stage) of larval and adult stages of *B. suturalis* on *Bemisia tabaci* in Field.

Conclusion

During investigation it was found that both adults and larvae of predatory beetle prefer the whiteflies. 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 whiteflies as compared to adult male.

ACKNOWLEDGEMENT

The reported data is a part of Ph.D. research work of the Principal Author, carried out under Higher Education Commission Islamabad sponsored project "Mass Rearing of Coccinellid Predators on Different Insect Pests". The authors are grateful to Higher Education Commission, Islamabad, authorities of Sindh Agriculture University, Tandojam, Pakistan and Pakistan Central Cotton Committee for providing funds and other necessary facilities.

REFERENCES

Ahmad, Z., 1999. Pest Problems of Cotton, a Regional Perspective. Proc. Regional Consultation, Insecticide Resistance Management in Cotton, Pakistan Central Cotton Committee, Pakistan. pp. 5-21.

Arif MJ, M.D Gogi, M. Mirza, K. Zia and F. Kafeez (2006). Impact of plant spacing and abiotic factors on population dynamics of sucking pests of cotton. Pakistan Journal of Biological Science 9 1364-1369.

Attique, M.R., A. Ghaffar, Z. Ahmad, A.I. Mohyuddin. 2003. Hosts of Bemisia tabaci (Genn.) (Homoptera: Aleyrodidae) in cotton areas of Punjab, Pakistan. Crop Protection, 22(5):715–720.

Chaudhuri GB, Bharpoda, TH, Patel JJ, Patel KI and Patel JR (1999). Effect of weather on activity of cotton bollworms in middle Gujarat. Journal of Agrometerology 1 137-142.

Gautam, R.D. and A. Tesfaye. 2002. Potential of green lacewing, *Chrysoperla carnea* (Stephens) in crop pest management. New Agroculturist. 13(1/2): 147-158.

Hodek, I. and Honek, A. 1996. Ecology of Coccinellidae. Kluwer Academic Publisher, Dordrecht Boston London, 446 pp.

Hussain A., A. Saleem, W .S. Khan and A.H. Tariq. 1991. Vector, whitefly (B. tabaci) In: Cotton leaf curl viruses, the problem, disease situation, research update and control. Public. Directorate of Agric. Inf. Lahore. 7 p.

Khuhro, S.N., Lohar. M.K., Nizamani, S.M., Abro, G.H. and R.D. Khuhro. 2008. Biology of lady bird beetle, *Brumus suturalis* Fabricius (Coleoptera:Coccinellidae) on cotton mealy bug, *Phenacoccus* sp .Pak.j. Agri., Agril. Engg., Vet. Sci. 24(2): 53-58.

Khan, W.S. and A.G. Khan, 1995. Strategies for increasing cotton production. National seminar held at Agric. House, 21-Agha Khan III Rd., Lahore. April 26-27, 1995.

Kapadia MN, Puri SN (1992). Biology of Serangium parcesetosum as a predator of cotton whitefly. J. Maharashtra Agric. Uni. 17:162-163.

Legaspi JC, Legaspi BC, Meagher RL, Ciomperlik MA (1996). Evaluation of Serangium parcesetosum (Coleoptera: Coccinellidae) as a biological control agent of the silverleaf whitefly (Homptera: Aleyrodidae). Environ. Entomol. 25:1421-1427.

Oliveira MRV, Henneberry TJ, Anderson PK, 2001. History, current status and collaborative research projects for Bemisia tabaci . Crop. Prot.20 709–723.

Shepard, B. M., 1999. Insects and their natural enemies associated with vegetables and soybean in South East Asia. Quality printing Company, Orangeburg, South Carolina, USA, 108 pp.