International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 24-09-2023, Accepted: 10-10-2023, Published: 26-10-2023
Volume 8, Issue 10, 2023, Page No. 43-45

Efficacy of augmentative release of *Bracon hebetor* say (Hymenoptera: Braconidae) for biological control of *Earias vittella* (Fabricius) (Lepidoptera: Noctuidae)

Swati Narayan Gavhane, D T Wagh
Department of Zoology, Bhagwan Mahavidayala Ashti, Beed, Maharashtra, India

Abstract
Bracon hebetor say is important biocontrol agent of the larval stage of many pests of economic importance. Present study was carried out to evaluate the efficacy of *B. hebetor* as a biological control agent against okra fruit and shoot borer, *Earias vittella*. Efficacy of augmentative release of *B. hebetor* as biological control of *E. vittella* in field was evaluated during the period from February to June 2021. Total number of parasitized larvae of *E. vittella* by *B. hebetor* were recorded at 1, 5, 10 and 15 days after release (DAR). A 74.8 % maximum field parasitization percentage of *B. hebetor* to *E. vittella* larvae was recorded at 5 Days after release (DAR) followed by 10 DAR and 15 DAR. The study revealed that, *B. hebetor* parasitizes about74.8% under field conditions. The augmentative release was effective and larval mortality was increased.

Keywords: Augmentative release, biological control, *Bracon hebetor*, *Earias vittella*, okra. Parasitization, *Corcyra cephalonica*, Polyphagous, Ectoparasitoid

Introduction

The spotted bollworm, *Earias insulana* (*Boisduva*l) and *Earias vittella* (*Fabricius*) (Lepidoptrra: Noctuidae) are serious a polyphagous insect pest of many economic crops widely distributed in North Africa, India Pakistan and other countries of the world. (A. J. Memon et al., 2004) feeding on a Malvaceous plant it lays eggs individually on leaves, floral buds and on tender fruits. Small brown caterpillars bore in to the top shoots and feeds inside the shoot before fruit formation. The infested fruits become unfit for consumption.

Okra crop is severely infested by fruit borer losses quality and quantity of the crops fruit (Bohmfalk et al., 2001). Many pests cause 69% yield reduction including leaf roller, jassid, fruit and shoot borer, also larvae of spotterd bollworm. Yield losses up to 49 to 74 % at Bangalore, Karnataka (Krishnaiah, 1980) 15 % at Ludhiana, Punjab (Brar et al., 1994), 31.81% at Coochbehar, West Bengal (Ghosh et al., 1999. It was estimated about 69 % loss in marketable yield due to attack of this insect on okra (Rawat and Sahua, 1973). The parasitoids are important natural enemies of crop pests. *Bracon hebetor* say (Hymenoptera: Braconidae) is a cosmopolitan, gregarious larval ectoparasitoid that attacks the larval stage of several lepidopteron species. (Brower et.al) *Bracon hebetor* female first paralyse their host in a "Wandering phase" by injecting paralytic venom and ovipositing variable number of eggs on the surface of paralyzed host larva. (Mukti and Thomas 2010). King et al., (1985) reported that field release of braconid parasitoid, *Chelonus blackbburni* Cameron at 50,000 adult's ha^{-1} gave promising control of *E. vittella*. With least fruit infestation of 11.64% Mani et al., (2005) reported the natural incidence of B. hebetor B. greeni and Trichogramma spp. In okra fields. Efficacy of braconids on okra fruit borers is very scare G. Thanavendan and S. Jiyarani (2009). So the present study aimed to evaluate efficacy of augmentative field release of *B.hebetor* to control E. *vittella*.in farmer fields.

Materials and methods

1. Collection and rearing of *Bracon hebetor*

Initial culture of *Bracon hebetor* was obtained from the National Institute of plant health management Rajendranagar (NIPHM). The *B. hebetor* was reared on *Corcyra cephalonica* larvae to increase the population of adults for experiment in the laboratory at 27°C temperature and 60% relative humidity. 50% honey solution was given as a food for adult *Bracon hebetor*.

2. Experiment

The Present study was conducted in Okra field of Malichinchora village Newasa Ahmednagar District Maharashtra during the period February to June 2021 for the eco-friendly management of Okra shoot and fruit borer through biocontrol agents. The crop was raised as per agronomic practices without chemical control. Adult *Bracon hebetor* were kept in a test tubes of 25 mm x150 mm size and carried out from the laboratory to the fields. Open mouth of the test tube containing adult *Bracon* was closed with cotton plug. Adult *B. hebetor* released at the rate of around 50 adults per m^2 (M: F = 20:30) field was divided in to four plots (150 m^2) and ridges (1 m) were made in each plot. Treatment was applied at seven days interval up to crop maturity. The *Bracon* treated plot was covered by fine mosquito net supported by bamboo sticks to protect the drift flying effects at least for 24 hrs. We found 2- 4 *E. vittella larvae* per plant. Sampling was done weekly, in each plot by placing a 0.5m.x 0.5m wooden quadrant on the ground at 10 m. interval. The Okra plant in each quadrant were checked for the number of all live and parasitized *Earias vittella* larvae from the top, middle and bottom of okra plants.

Results and discussion

In Okra field, parasitism of the *E. vitella* by *B. hebetor* was first observed at experimental plots 24 hours after release of parasitoid. Mean density of the pest larvae (live & parasitoid) in plot no. 1 was 0.8, 3.2, 3.6 and 2.2 larvae 1st, 5th, 10th and 15th day respectively. While in plot no.2 was

1, 3.6, 3 and 2.8 larvae on 1st, 5th, 10th and 15th day respectively. Mean density of the pest larvae in plot no.3 was1.2, 2.8, 3.4 and 3 larvae on 1st, 5th, 10th and 15th day respectively and in plot no.4 mean larval density was 1.6, 3.4, 3.8, and 2.6 on 1st, 5th ,10th and 15th day respectively.

The field Parasitism in plot no.1 was 13.4, 74.8, 61.8,58.2 % on 1st, 5th, 10th, 15th day respectively, in plot no.2 it was 17.8, 7.3, 3 ,63.8, 60 % on 1st, 5th ,10th, 15th day respectively in plot no.3 was 19.28, 74, 67.2,57.4% on 1st, 5th ,10th, 15th day and in plot no.4 was 23.4, 74.2, 65.4, 61.8 % on 1st day ,5th day ,10th day, 1th day respectively.

Results showed that maximum parasitism was occurred 5 DAR and it declines in 10 and 15 DAR. According to the experiments *B. hebetor* could parasitizes *Earias vittella* till 74.8% under field condition.

Discussion

In present study *B. hebetor* parasitizes *E. vittella* larvae immediately after release. *B. hebetor* first paralyzed the larvae and oviposited. Among various larval instars of *E. vittella* fourth instar larvae were parasitized by *B. hebetor*. According to G. Thanavendan and S. Jiyarani (2009) fourth instar larvae were preffered by parasitoids than early instars. The studies on parasitic potential of *B. hebetor showed that the highest* parasitization of 74.8 % was recorded against *E. vittella* 5 DAR and it declines on 10th and 15th day after release.. *B. hebetor* is capable of locating and attacking fourth instars of *E. vittella*. According to Canale and Loni (2006) including braconids (Taylor 1988). The low preference for first and second host instars by *H. hebetor* could be due to host selectivity which is a common phenomenon among several parasitoids. The use of age dependent cues has been described as one of the mechanisms parasitoids use to discriminate between different stages of the same host (Mattiacci and Dicke 1995 a). Early instars feed deep within the food medium therefore it was difficult to locate and parasitize (Sait et al 1997). Sadat et al. (2014) showed that, among different tested lepidopteran host of *B. hebetor E. kuehniella Zeller*, *Apomyelois ceratoniae Zeller* (Lepidoptera: Pyrallidae) and *H. armigera*, the least parasitism percentage belong to *H. armigera* larvae (20.8%). Ghimire and Philips (2010) [5] demonstrated that pyralid hosts are more suitable host such as Heliothis sp for the parasitoid wasp.

Similar results were reported by Leila Nazarpour et al., (2012) against *H. armigera* larvae in tomato fields, who recorded that maximum parasitism was occurred 4DARand it declines 9 and 13 DAR the field parasitism was 73%. Navaei et al., (2002) in Iran against *Helicoverpa armigera* larvae in cotton fields. Adashkevich et al., (1996) [2] studied field dispersal of *H. hebetor* within 6 days after release in tomato field in Russia, while in the present study *B. hebetor* dispersal was monitored for two weeks. Ibrahim Boukary et. al., (2018) [7] released bags of host larvae with mated *H. hebetor* females. In the present study we released adult wasps, directly, our findings clearly revealed that 50 female per m. sq. was considered to be appropriate for reducing the pest population.

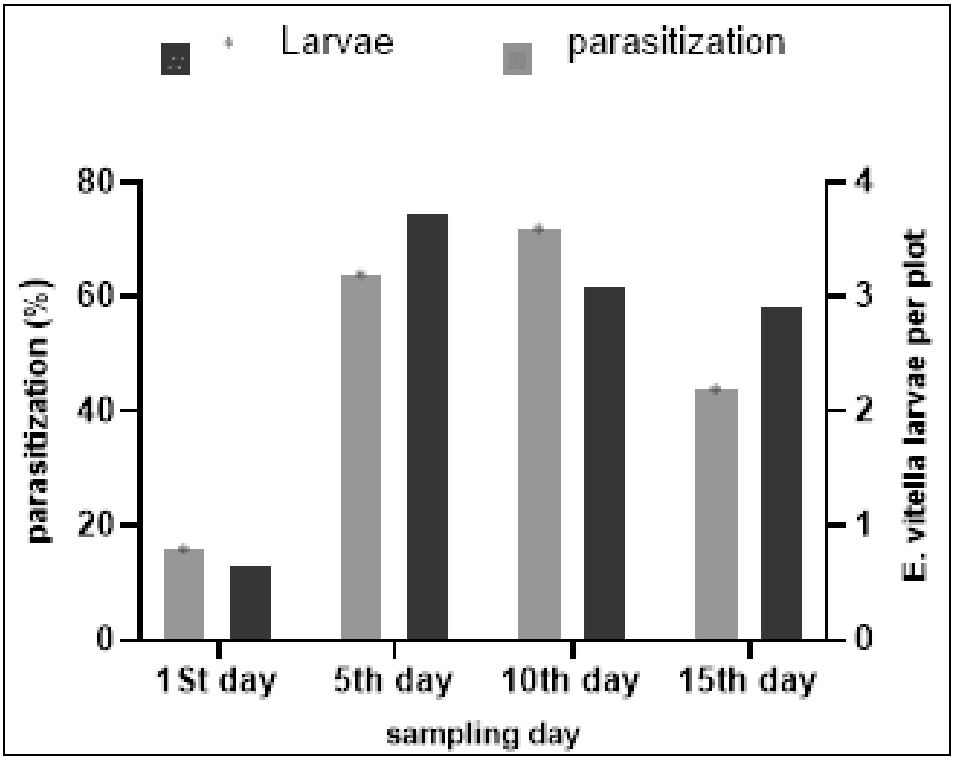

Fig 1: Mean density of E. vitella and parasitism percentage by B. hebetor on various days after augmentative release.

Table 1: Mean density of *Earias vittella*

Plot No	1st day	5th day	10th day	15th day
Plot No. 1	0.8 ± 1.14	3.2 ± 2.2	3.6 ± 2.2	2.2 ± 1.45
Plot No. 2	1 ± 0.71	3.6 ± 2.8	3 ± 0.71	2.8 ± 1.26
Plot No. 3	1.2 ± 0.55	2.8 ± 3	3.4 ± 0.55	3 ± 0.71
Plot No. 4	1.6 ± 1.3	3.4 ± 2.6	3.8 ± 1.3	2.6 ± 1.14

Table 2: Parasitization percentage of *Bracon hebetor* to *Earias vittella*

Plot No	1st day	5th day	10th day	15th day
Plot No. 1	13.4 ± 1.14	74.8 ± 0.84	61.8 ± 2.05	58.2 ± 3.11
Plot No. 2	17.8 ± 0.84	73 ± 2.12	63.8± 2.17	60 ± 4.3
Plot No. 3	19.28 ± 1.48	74 ± 2.92	67.2± 1.64	57.4 ± 2.79
Plot No. 4	23.4 ± 2.07	74.2 ± 1.92	65.4 ± 4.16	61.8 ± 3.83

Conclusion

The findings of the present study revealed that the *Bracon hebetor* parasitizes *Earias vittella* larvae, percent parasitization of *Bracon hebetor to Earias vittella* under field conditions were 74.8%, hence the augmentative release was effective and larval mortality was increased and thus crop damage was reduced. It could be concluded that biological control agents can be used as a promising alternative for chemical pesticides in control of *Earias vitella* in Okra fields.

References

1. Abdoodhnabi Bagheri, Majeed Aksari Seyahooei, Yaghoub Fathipour, Maryam Famil, Fatemeh koohpayma. Akhtar Mohammadi- Rad and shabhnam parichehreh Ecofriendly managing of *Helicoverpa armigera* in tomato field by releasing *Trichoramma evanescence* and *Habracon hebetor*. J. Crop prot,2019:8(1):11-19.
2. Adashkevich BP, Saidova, E, Takanave AA. *Migration of Habrobracon Zashchita* Rastenil,1986:7:35- 36.
3. Ba NM, Baoua IB, Kabore A, Amadou L, Oumarou N, Dabire Binso CL, Sanon A. Augmentative on-farm delivery methods for the parasitoid *Habrobracon hebetor Say* (Hymenoptera: Braconidae) to control the millet head miner Heliocheilus albipunctella (Lepidoptera: noctuidae) in Burkina Faso and Niger. Bio control,2014:59(6):689-696.
4. Baoua IB, Amadou L, Oumarou N, Payne W, Roberts JD, Stefanova K, Nasen C. Estimating effect of augmentative biological control on grain yields from individual pearl millet heads. J. Appl Entomol,2013:1-28:138:281-288.
5. Ghimire MN, Phillips TW. Suitability of Different lepidopteran host species for development of *Bracon hebetor* (Hymenoptera; Braconidae). Environ Entomol.2010:39:449-458.
6. Mansion H, Kumar A, Jeengar D. Insect peste of Okra and their Management. Vigyan Varta,2022:3(12):71-78.
7. Ibrahim Boukary Baoua, Malick N. Ba, Laouali Amadou, Adama Kabore & Clementine L. Dabire-Binso. Field dispersal of the parasitoid wasp *Habrobracon hebetor* (Hymenoptera; Braconidae) following augmentative release against the millet head miner Heliocheilus albipunctella (Lepidoptera: noctuidae) in the sahel, Biocontrol Science and Technology,2018:108:64-69.
8. Kumbhar TT, Kokate AS, Dumbre AD. Studies on the varietal resistance in okra, Abelmoschus L. (Moench) to shoot and fruit borer, Earias spp. Maharashtra. J. Hortic.,1991:5:78-82.
9. Laouali Amadou. Malik N. Ba Ibrahim Baoua Rangaswamy Muniappan Timing of releases of the parasitoid *Habrobracon hebetor* and numbers needed in augmentative biological control against the millet head miner *Heliocheilus albipunctella* (2019) Biocontrol,2019:5:573-581.
10. Leila Nazarpoar, Fatemeh Yarahmadi, Ali Rajabpour, Moosa Saber Effieacy of Argeaced Augmentative Release of Habrabracon hebetor say (Hym Braconide) for Biological control of *Helicoverpa armigera* (Lepidoptera: Noctuidae)
11. Mame fatoumata Goudiaby, Ibrahima Sarr, N.B. Malick, Mbacke Sembene and Rangaswamy Muniappan Efficacy of augmentative release of the parasitoid wasp *Bracon hebetor* against the pearl head miner J. Biological control,2019:33:185-192.
12. Singh D, Singh H, Brar HS. Effect of spotted bollworm, Earias spp. Infestation on yield and quality of Okra seeds. Ind. J.Ecol.,1985:12:100-103.
13. Vyas SH, Patel JR. Relative susceptibility of some ladys finger cultivers to *Earias vittella* (Fabricius). Ind. J. plant protect,1990:18:115-118.