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A Review on Recent Advances in Rearing of the Larval Parasitoid Bracon hebator (Say)

Deepayan Padhy*, V Ramalakshmi, Lipsa Dash and Shimantini Borkataki
Department of Entomology, MS Swaminathan School of Agriculture, Centurion University of Technology and Management, Nagpur, India

ABSTRACT

Larval parasitoid, *Bracon hebator* (Say) is being utilized in various bio-control research, developmental and extension units for management of lepidopteran peast in their larval stages. *Larval parasitoid B. hebator* ranks first in the management of lepidopteran insects. Production of *B hebator* nutritional requirements have to be taken into account because nutritional deficiencies have been linked with such vague symptoms like poor growth rate, lowered fecundity or reduced body weight. As it is one of the most effective parval parasitoid for different lepidopeteran pests various dietary formulations were developed in the present study with differet combinations and the effects of these formulations on the growth, development, reproduction of *B hebator* were reviewed.

INTRODUCTION

With the increasing demand for environmental safety and global demand for pesticide free food An eco-friendly methods of pest management is highly essential. As a result of which, biological control method has achieved the new international trends, which helps in conservation and sustainable use of biological resources as compatible a manner as possible. *Bracon hebetor* (Say), the larval parasitoid is considered as one of the potential biological control agents against larval stage of lepidopteran pests. It is a gregarious ecto-parasitoid completing its larval stage on different species of Lepidoptera (especially Pyralidae) in their larval stage. It has already been successfully utilized in integrated pest management. Most of the species of Pyralidae are agricultural pests on some field crops and storage crops. The most important species of those insect pests are *Ephestia kuehniella* (Z.), *E. cautella* (Walk), *Galleria mellonella* (L.), *Achroia grisella* (F.), *Helocoverpa armigera* and *Corcyra cephalonica.*

The efficiency of biological control depends upon the ability of the production of relatively inexpensive biological control agents of insect pests. The production of beneficial insects, especially parasitoids, has improved substantially in recent years. The life table is one of the tools, used in quantitative analysis and in estimation of populations. So the present study was mainly focused on the effect of different hosts on the developmental time, longevity, fecundity and life table parameters of B. hebetor. The aim was to find the most suitable hosts for rearing *B. hebetor* to use as effective biological control agent.

RESULTS AND DISCUSSION

Bracon hebator is reared in "Sandwich method". About 100 pairs (both males and females) freshly emerged adults from "Bracon pupal card" are caged in rearing jars measuring about 15*10 cm. A cotton swab soaked in 50% honey is provided to the side of the jar wall as a adult food. The mouth of the jar is then screwed with piece of muslin cloth by rubber band. About twenty numbers of 5th instars caterpillars of rice moth or any other lepidopteran larvae of similar size (particularly black headed caterpillar) are placed over the muslin cloth

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*Corresponding author email: deepayan28@cutm.ac.in
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and another piece of cloth and another piece of cloth is tightly tied over the first by rubber band. The female parasitoids lay eggs on the host larvae throughout the muslin cloth. Before laying eggs they inject venom to the larval body. The injected venom paralyze the body of the larva and also prevent them from rotting. The parasitized larvae are removed by forceps after 24 hours of exposure and are arranged over an art paper strip. The paper strip is inserted into a specimen tube and kept in a horizontal rack. New batch of caterpillars are placed over the first layer of muslin cloth and the process continues. The *Bracon* eggs hatch in 1.5 to 2 days. The larva feed in the *Corcyra larva* for 3-4 days. During pupation, the Bracon larvae leave the host (*Corcyra*) larva and pupate on the paper strip.

The host (*Corcyra*) turns black and are removed by forceps. The cocoons (pupa) present in the paper strip can be stored in refrigerator for 3-4 weeks. Some pupal cards are used for further rearing of Bracon. Rest are released in the field. For effective release of the parasitoids in the field, pupal cards are stapled or tied with the coconut leaflets @ one card per ten plants (100 cocoons per 10 plants) for controlling black headed caterpillars. The major species of the parasitoids are *Bracon hebator* and *B. brevicornis*. The parasitoids may also be released in the adult stage @5-10 adults / palm or 500-1000 adults / ha. Two or three releases may be required depending on the intensity of pest infestation. The first release is initiated in the first week of February or depending upon the pest intensity.

The parasitoids may also be deployed against leaf eating caterpillars of different crops (such as leaf folder in paddy, leaf worm, semi looper and leaf roller in cotton etc) at the dose and intervals mentioned above. We can sell a card @ Rs. 15/- per card each containing approximately 100 cocoons. Pre treatment and post treatment pest population and/or damage may be compared. Larva may be collected before and after release of parasitoid. They may be reared separately in the laboratory for adult emergence and per cent parasitization may be calculated. It shouldn't be treated with insecticides. Mahadavi et al. in 2011 in their studies showed that carbaryl had more adverse effects on population parameters of the parasitoid compared to abamectin. Field studies are needed to determine the total effects of the pesticides on *Habrobracon hebetor*.

Sadat and Bandani in 2014 studied the effect of different lepidopteran hosts, *Ectomyelois ceratoniae, Plodia interpunctella, Ephestia kuehniella, Helicoverpa armigera* and *Malacosoma disstria* on the biological parameters of this *Bracon*. Comparatively, the parasitoid performed better on stored product pests, such as *Ephestia kuehniella* and *Plodia interpunctella*, than field crop pests, such as *Helicoverpa armigera* and *Manduca disstria* in terms of percentage egg hatch, rate of development, off-spring sex ratio and adult dry mass. The greatest activity of the quality and quantity of the proteases and α-amylase was recorded in the gut of those parasitoids that were reared on stored product insects (*P. interpunctella* and *E. kuehniella*). It is concluded that stored product insects, which feed on a diet rich in sugar and glycogen, provide physiological conditions that are more suitable for the parasitoid than field crop insects, which feed on diet rich in terpenes and tannins.

Magro and Parra in 2003 has studied the biology of the ecto-parasitoid Bracon hebetor Say on seven different types artificial diets under controlled environment and compared it with its biology on its natural host *Anagasta kuehniella* (Zeller). Though the life cycle duration (egg–adult) and female longevity was not significantly different but failure of the pupa to produce a protective cocoon during the pupal phase was observed in 60% of the larvae developed on the artificial diet indicating that natural host are superior as compared to artificial diet are good option for rearing of these larval parasitoids. Farag et al. in 2015 studied on the life table of Bracon hebetor adult reared on three different hosts Greater wax moth (*Galleria mellonella*), Mediterranean Flour Moth (*Ephestia kuehniella*) and Rice moth (*Corcyra cephalonica*) Stainton. The developmental time was significantly shortened when parasitoid reared on G. mellonella. The total number of eggs deposited by female of B. hebetor reached its maximum of (395.11 eggs) on *G. mellonella* comparing to (93.5 and 56 eggs) on *E. kuehniella* and *C. cephalonica* respectively. Ashfaq et al. in 2011 given a refined rearing technique for Bracon hebetor on large scale on a host, waxmoth, *Galleria mellonella*, at different temperature and humidity percentages. In the light of their experiments, they have concluded that pupal stage is the best stage of storage of the parasitoid for its timely releases (as long as 4 weeks at 50C). They concluded the temperature range of 25-30°C is found to be best suitable temperature for the rearing of the parasitoid.

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