



## **Biology of *Bracon*: A Biological Control Agent of *Antigastra catalaunalis*, Leaf Webber /Capsule Borer of *Sesamum indicum***

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### **ABSTRACT**

*Bracon* sp. (Hymenoptera: Braconidae) is a gregarious, ecto-larval parasitoid. In the present study, Biology of *Bracon* sp. is taken to understand the natural parasitism of this parasitoid as biological control agent on *Antigastra catalaunalis* Duponchel major insect pest of sesame crop. Development period of parasitoid was recorded on different temperatures. It was observed longest  $31.2 \pm 0.86$  Hrs. (25°C) and shortest  $18.2 \pm 1.8$  Hrs. (35°C) incubation period of eggs, recorded longest  $61.6 \pm 5.45$  Hrs. (25°C) and shortest  $31.8 \pm 7.6$  Hrs. (35°C) period of larvae, observed longest  $157 \pm 5.21$  Hrs. (25°C) and shortest  $132.4 \pm 7.4$  Hrs. (35°C) period of pupae. Longevity of male adult was observed  $11.8 \pm 0.37$  days (25°C) and longevity of female adult was observed  $17.4 \pm 0.87$  days (25°C).

**Keywords:** *Bracon* sp., *Antigastra catalaunalis*, Biological Control, natural parasitism

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### **INTRODUCTION**

Sesame is one of the oldest crops known to humans. There are archeological remnants of sesame dating to 5,500 BC in the Harappa Valley in the Indian subcontinent [1]. Assyrian tablets from 4,300 B.C. in a British museum describe how, before the gods battled to restore order to the universe, they ate bread and drank sesame wine together [2]. Sesame is considered to have both nutritional and medicinal values. It is clear that the increase in sesame production during last decade was mainly due to the increase in its growing area, especially in newly reclaimed Sandy soils [3]. India ranks first in area under cultivation representing 30% of the world production and Rajasthan, Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, Uttar Pradesh, West Bengal, Orissa, Punjab and Tamil Nadu are the major states of sesame cultivation [4]. It also grown in Assam, Bihar, Haryana, Jammu and Kashmir, Kerala, Himachal Pradesh, North Eastern hill states and Pondicherry [5]. The sesame yield is greatly affected by the attack of insect pests. In India, the crop is reported to damage by more than 30 species of pests [6, 7]. Shoot webber and capsule borer, *Antigastra catalaunalis* Duponchel (Lepidoptera: Pyralidae) is the most serious pest causing 25.00 – 90.00 per cent yield loss [8]. Other major pests are sesame gall fly, *Asphondylia sesame* Felt (Diptera: Cecidomyidae); til hawk moth, *Acherontia styx* Westwood (Lepidoptera: Sphingidae); jassid, *Orosius albicinctus* Distant (Hemiptera: Cicadellidae); and mite, *Polyphagotarsonemus latus* Bank (Acarina: Tarsonemidae). The minor pests of this crop include bud fly, *Dasineura sesami* Grover and Prasad (Diptera: Cecidomyidae) and white fly, *Bemisia tabaci* Gennadius (Hemiptera: Aleurodidae). Sesame leaf webber is reported to attack the crop in all growth stages, after about two weeks of emergence [9]. But the attack is more severe during dry seasons and after initiation of flowering. It feeds on tender foliage by webbing the top leaves, bores into the pods and shoots [10]. Braconid wasps represent one of the most diverse and abundant of the parasitoid groups [11]. Braconidae is the second most important family of parasitoid wasps in biological control, having been introduced in successful IPM programmes [12]. Different aspects in life stages of *Bracon* sp. are discussed on the host, *Antigastra catalaunalis* major insect pest of sesame crop.

### **MATERIAL AND METHODS**

Parasitoid *Bracon* sp. were obtained from the naturally parasitized major insect pest of sesame crop leaf webber/capsule borer, *Antigastra catalaunalis* larvae collected from infested crop of *Sesamum indicum* in research field Nagla Sirji and reared in Entomology Research Laboratory, Department of Zoology, Agra College Agra. Experiments were carried out at  $25 \pm 1^\circ\text{C}$ ,  $30 \pm 1^\circ\text{C}$ ,  $35 \pm 1^\circ\text{C}$  and  $70 \pm 5\%$  RH in BOD incubator. Larvae of *Antigastra catalaunalis* as a host insect were used for rearing of *Bracon* sp. parasitoid. Each

newly emerged couple, male and female of *Bracon sp.* were placed in small glass vials (10 cm in length and 2.5 cm in circumference) and kept 50 per cent honey solution dipped cotton swab as food for adult parasitoids. Host insect pests, *Antigastra catalaunalis* larvae were collected from research field and sesame plant shown in the vicinity of Zoology Department. Larvae were kept in 500ml plastic jar and provided leaves, flower and capsule of sesame as food. Full grown larvae of *Antigastra catalaunalis* as a host insect kept in glass vial to allow *Bracon Sp.* parasitoid to attack and egg laying on host larvae. Glass vial covered with muslin cloth with the help of rubber ring. Parasitized larvae of host insect *Antigastra catalaunalis* larvae were removed from the glass vial after 24hrs and transferred to Petri dishes and kept under the observation until adult emergence. New host larvae were transferred in this glass vial. Development period of Eggs laid by parasitoids on host larvae, larva and pupa were recorded on different temperature. Longevity of male and female parasitoids were also recorded.

### Statistical Analysis

All experiments were subjected to analysis of variance (ANOVA). Development period of egg, larvae, pupae and longevity of male and females *Bracon sp.* adults under different temperatures were analyzed by one-way ANOVA and compared using Duncan's Multiple Range Tests (DMRT) at 0.05 level of significance.

## RESULTS AND DISCUSSION

During observation, it was found that Female *Bracon sp.* attack on host larvae and inject venom that paralyzes the host. After paralysis of host larvae, female *Bracon sp.* laid several eggs on the ventral side of host. Period of different stages of *Bracon. Sp.* ecto- parasitoid of *A. catalaunalis* Duponchel insect pest of sesame crop is given below.

### Eggs Stage:

Eggs are translucent and milky whitish in color. Incubation period was observed longer 31.2±0.86 Hrs. (25°C) and shortest 18.2±1.8 Hrs. (35°C). Developing larva was visible through the transparent chorion before hatching. Egg rupture due to pressure of developing larva and neonate larva come out from the egg.

### Larval Stage:

After some time of hatching the larva of *Bracon Sp.* ecto-larval parasitoid puncture on the larval body of *Antigastra catalaunalis* major insect pest of sesame crop and start feeding haemolymph. Larvae of parasitoids develop rapidly due to continuous feeding on host haemolymph. Head region is distinct and body is segmented. In the initial stage, the body is yellowish white but the colour of full grown larva changes yellowish white to greenish white. Full developed larva measures from 2.4-3.2 mm in length and 0.78-1.4 mm in width. Average larval period was recorded longest 61.6±5.45 Hrs. (25°C) and shortest 31.8±7.6 Hrs. (35°C).

### Pupa Stage:

Full grown larva stops feeding and ready to change in pupa. Full fed larva of *Bracon sp.* move away from the host larval body. After detachment from host's larva, parasitoid larva starts spinning a cocoon near host body. Cocoon is transparent at its base and pupa can be seen. Cocoon measures 3.8mm in length and 1.6mm in width. Color of pupa is yellowish white in beginning changes in reddish brown before emergence of adult. Pupal period of *Bracon sp.* parasitoid was observed longest 157±5.21Hrs. (25°C) and shortest 132.4±7.4 Hrs. (35°C).

### Adult stage:

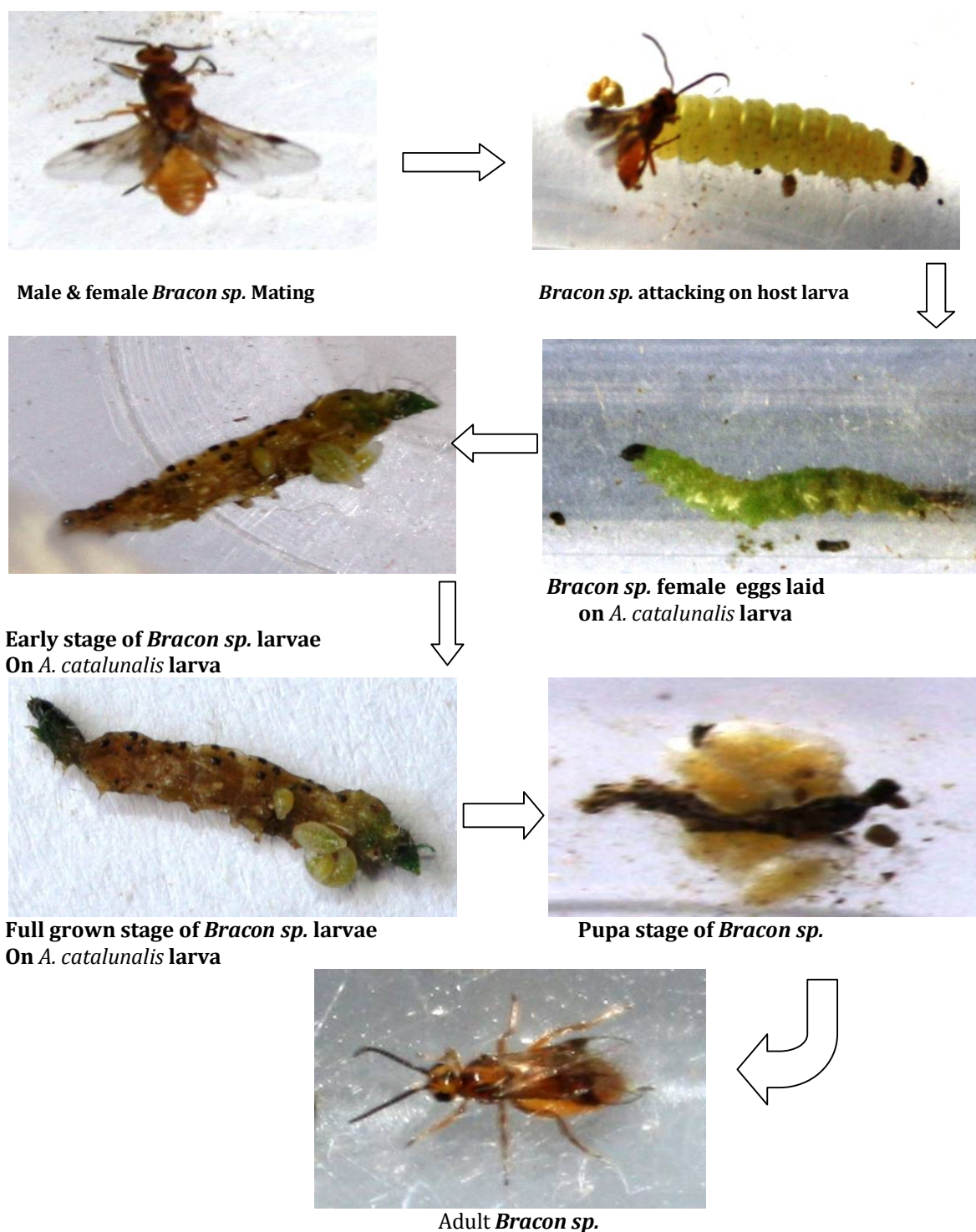
Longevity of male adult parasitoid was observed 11.8±0.37 days (25°C) and longevity of female adult was observed 17.4±0.87 days (25°C).

**Table 1. Duration of different developmental Stages of *Bracon sp.* parasitoid with their host *Antigastra catalaunalis* Duponchel larvae on different temperatures**

Temp.	Egg Incubation period (Hr)	Total Larva period (Hr)	Total Pupal period (Hr)
25 °C	31.2±0.86 <sup>a*</sup>	61.6±5.45 <sup>a</sup>	157±5.21 <sup>a</sup>
30 °C	23.4±1.7 <sup>b</sup>	40.0±4.0 <sup>b</sup>	146.4±8.0 <sup>b</sup>
35 °C	18.2±1.8 <sup>c</sup>	31.8±7.6 <sup>c</sup>	132.4±7.4 <sup>c</sup>
F value (P < 0.05)	39.68	12.91	6.72

**\*Note:** The values indicate mean ±SE. Values followed by the same letter within a column do not differ significantly at P < 0.05 of DMRT.

Fig. 1: Different Stages of *Bracon sp.* parasitoid with their host *Antigastra catalaunalis*



### CONCLUSION

On the basis of present study, it was found that *Bracon sp.* parasitoids naturally parasitize the *Antigastra catalaunalis* Duponchel and the biology of this parasitoid studied in laboratory shows that major insect pest *Antigastra catalaunalis* may be controlled by using *Bracon sp.* as a biological control agent. Temperature significantly affects the duration of all the developmental stages of *Bracon sp.*

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