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Biology of *Eucelatoria bryani* Sabrosky (Diptera : Tachinidae), A Larval parasitoid of *Heliothis armigera* (Hubner) *

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ABSTRACT

Detailed biology of the parasitoid *Eucelatoria bryani* Sabrosky was studied under laboratory condition. The incubation period and duration of first, second and third instars were 138 ± 2.02, 29.93 ± 2.01, 33.67 ± 1.95 and 36.87 ± 2.47 respectively. The pre-pupal and pupal periods were 5.40 ± 1.18 and 6.93 ± 0.96 days, respectively. Total life cycle occupied 23.89 ± 1.04 days. Food influenced the fecundity and longevity of the parasitoid.

KEY WORDS : *Eucelatoria bryani*, biology, *Heliothis armigera*.

Eucelatoria bryani Sabrosky, a tachinid larval parasitoid of *Heliothis* spp. in U.S.A., has been introduced into India and is being tried against *H. armigera* (Hubner) attacking cotton, tomato, etc. Jackson *et al.* (1969) and Bryan *et al.* (1970, 1972) have given some information on the biology of this parasitoid under the name *Eucelatoria armigera* Coq. But after the partial revision of the genus *Eucelatoria*, Sabrosky (1981) named this species as *E. bryani*. Since information on the biology of this parasitoid is very scanty, an attempt was made to study it in detail and the results are presented in this paper.

MATERIALS AND METHODS

Culture of the parasitoid *E. bryani* was maintained on *H. armigera* by adopting the method reported by Sankaran and Nagaraja (1979) for *Eucelatoria* sp. nr. *armigera* Coq.

Since the species is larviparous, incubation period was studied by dissecting out 15 mated females at 6h intervals. The number of larval instars and the duration of each larval instar were studied by dissecting out 15 parasitised host larvae in distilled water at 12 h interval. After completion of larval period, maggots came out of the host body for pupation. Such 15 full grown maggots in three replications were taken for recording pre-pupal and pupal periods. The time taken by freshly emerged flies for complete wing spreading was observed in 30 flies. Time required for mating was recorded by releasing a pair of freshly emerged female and a day-old male in a specimen tube (7.5 x 2.5 cm). The experiment was replicated three times with 13 pairs in each. Thirty flies were taken and host larvae were exposed for parasitisation. The duration from mating till first larviposition was recorded as pre-larviposition period and similarly, the period between first and last larviposition was recorded as larviposition period. Fecundity with and without food was studied on 5 freshly emerged females and the experiment was replicated three times. Each female was placed in a small rearing cage (11 x 7 x 12 cm) individually with 50 per cent honey as food. Another three sets having five freshly emerged females in each were placed without food. Females were dissected and observed for the eggs. Longevity of male and female was studied separately with and without food by exposing five freshly emerged flies in three replications. To study the sex ratio, an experiment was conducted with three replications. Each replication consisted of 200 puparia reared from parasitised larvae. The number of male and female flies emerged in each replication was noted and sex ratio was calculated. In the laboratory maximum and minimum temperature recorded during the period of study were 28.8°C and 17.4°C, respectively with an average relative humidity of 61.7 per cent.

RESULTS AND DISCUSSION

Since this parasitoid is larviparous and deposits maggots directly into the body of host, the incubation of eggs was observed in the uterus of adult fly. The egg was microtype creamy white, minute and spherical in shape (Fig. IA). It had a smooth chorion without any sculpture on it. The width of the egg was 0.22 ± 0.02 mm. The mean incubation period was 138.6 ± 0.02 h.

First instar larva (Fig. IB-1) was very minute, delicate with narrow pointed anterior and broad posterior end. Body was eleven segmented. The bucco-pharyngeal armature of the first instar (Fig. IB-2) consisted of two slightly curved black oral hooks joined to a pair of dorsal and fused ventral

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cornua. The larva measured 1.035 ± 0.04 mm in length and 0.43 ± 0.02 mm in width. The length of bucco-pharyngeal armature was 0.14 ± 0.01 mm and 0.110 ± 0.001 mm in width. The horizontal movement of the bucco-pharyngeal hook could be seen under a stereobinocular microscope. The first instar larval period was 29.93 ± 2.01 h.

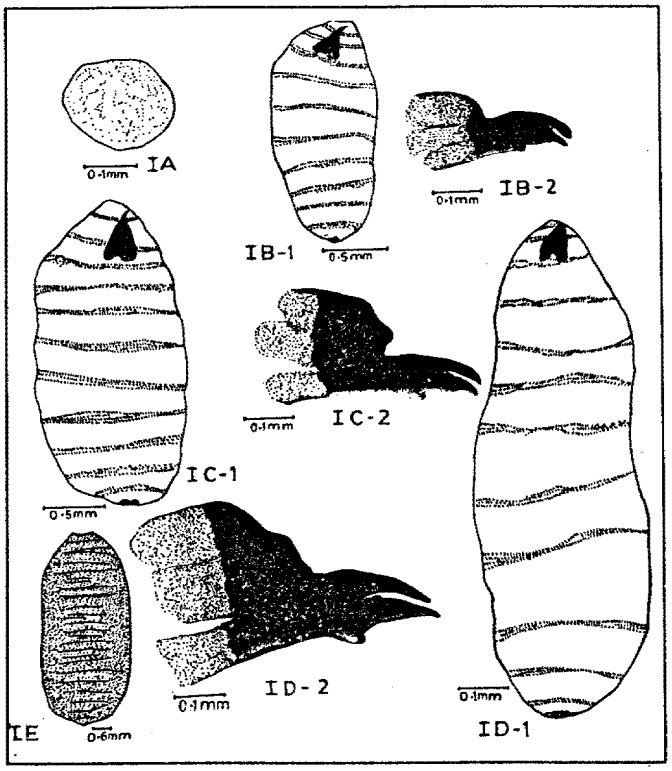

Fig. 1 *Eucelatoria bryani* Sabrosky
A. Egg, B1.I instar larva, B2. Bucco-pharyngeal armature of I instar. C1. II instar larva, C2. Bucco-pharyngeal armature of II instar, D1. III instar larva, D2. Bucco-pharyngeal armature of III instar, E. Pupa.

The body segmentation in second instar larva was found clear with twelve segments. The larva measured 1.44 ± 0.10 mm in length and 0.61 ± 0.03 mm in width (Fig. I C-1). The length and width of bucco-pharyngeal armature was 0.54 ± 0.60 mm and 0.28 ± 0.04 mm, respectively (Fig. I C-2). Duration of second instar larva lasted for 33.67 ± 1.95.

In the third instar larva, tip of the bucco-pharyngeal armature was visible externally. The body measured 2.150 ± 0.134 mm in length and 0.385 ± 0.041 mm in width (Fig. I. D-1). The size of bucco-pharyngeal armature measured 0.853 ± 0.043 mm in length and 0.385 ± 0.041 mm in width (Fig. I.D-2). The third instar larva occupied 36.87 ± 2.47 h. The total larval period occupied 4.19 days. These results are in agreement with those of Jackson *et al.* (1969) and odak *et al.* (1986) obtained on *E. bryani*.

The full grown larva came out of the host by puncturing from any part for pupation. During pre pupal stage, body colour of the maggot changed from white to pale red in colour. The pre pupal stage occupied 5.40 ± 1.18 h. The puparium (Fig. I E) was of exarate type. It was short and red in colour when freshly formed and gradually turned to dark brown in colour. The puparium was smooth, regularly cylindrical, widest in the mid-abdominal region with cephalic and caudal ends smoothly rounded. Segmentation was fairly distinct when freshly formed but after a day or two, the change in colour caused the segmentation somewhat indistinct. The puparium measured 1.94 ± 0.19 mm in length with a width of 1.00 ± 0.18 mm. The pupal period was 6.93 ± 0.96 days which did not conform with the findings of Jackson *et al.* (1969) who reported that pupal period of *E. bryani* ranged from 6.9 ± 0.6 days at 15°C and 34.4 ± 1.9 days at 30°C in *H. zea* (Boddie) and 7.3 ± 0.6 and 32.4 ± 1.9 days in *H. virescens* Fabricus at 15°C and 30°C respectively. Bryan et al. (1970) reported 24.8 ± 1.6 days at 15°C and 5.9 ± 0.4 days at 30°C respectively in *Spodoptera exigua* (Hub). The variation may be mainly due to the differences in host species used in the study.

The adult characters and sex differentiation have been described by Sabrosky (1981). When viewed through an ordinary lens (5x), the last abdominal segment in the case of female although appeared with rounded sides was not tubular as generally observed in other tachinids (Fig. II a). The intromittant organ of the male in the last abdominal segment as seen from the ventral side was knob like (Fig. II b) and similar to that observed in *Sturmiopsis inferens* Tns. (Jai Rao and Baliga, 1968). The total life cycle of the parasitoid occupied 23.89 ± 1.04 days. But Jackson *et al.* (1969) reported 10.7 ± 0.7 days to 49.4 days for completing a life cycle in *H. zea*. Variations are due to different species of host used in the study.

The newly emerged flies took 3.17 ± 0.93 minutes for complete wing spreading. Flies mated soon after their emergence. Mating time lasted for 9.74 ± 2.87 minutes. These results are not in agreement with Jackson *et al.* (1969) who reported 15 to 30 minutes in this species. The variation may be due to different temperature and humidity under which the parasitoid was reared. The pre-larviposition period occupied seven days.

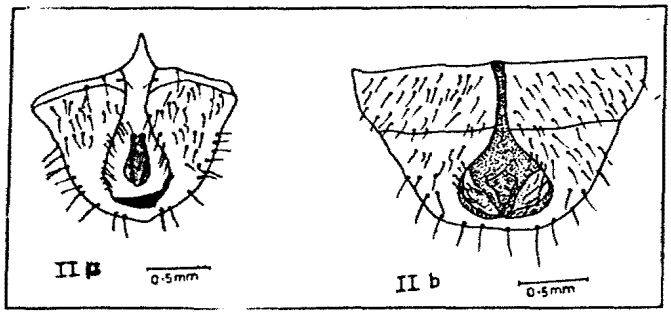

Fig. II. *Eucelatoria bryani* Sabrosky
A. Ventral view of last abdominal segment of male
B. Ventral view of last abdominal segment of female.

After completion of gestation (pre-larviposition) period, host larvae were exposed for parasitisation. The flies approached the host with characteristic movement. Flies sat on the body of host and with the help of larvipositor parasitised the host larva. Immediately after parasitisation, haemolymph oozed out. Although intersegmental region was the preferred area for larviposition, parasitisation was also observed on other regions of the body. The parasitised larvae remained as active as unparasitised ones on first and second days. Third day onwards they became inactive and fed very little as compared to unparasitised larvae and died on the fourth day. Fecundity of the parasitoid with food (50 per cent honey) and without food was 74.13 ± 17.01 eggs and 62.41 ± 21.50 eggs, respectively. Male adults lived for 13.8 ± 2.91 and 1.80 ± 0.77 days with and without food, respectively whereas females lived for 29.33 ± 1.84 and 2.06 ± 0.59 days with and without food, respectively. Sex ratio from male to female was found to be 1 : 1.33. This is in agreement with the report of Odak *et al.* (1982).

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