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Biology of *Actia monticola* Mall (Diptera: Tachinidae), an internal larval parasitoid of *Tarache notabilis* (Walker) (Noctuidae: Lepidoptera)

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ABSTRACT

Actia monticola Mall (Diptera: Tachinidae) is an internal larval parasitoid of cotton semilooper Tarache notabilis (Walker) (Noctuidae: Lepidoptera). The parasitoid completed its life cycle within 14 days at laboratory conditions (25±1oC, 65-70% R.H., 14 hr photoperiod). Incubation period was 2-3 days, larval period was 6 days and pupal period was 6 days. Adults survived for 15 days and 17 days in males and females respectively. A. monticola is good biocontrol agent of T. notabilis. The present work will be helpful for mass rearing of A. monticola and further its utility in biological control programmes.

KEYWORDS : Actia monticola, biocontrol agent, Tarache notabilis, control

INTRODUCTION

Cotton semilooper Tarache notabilis (Walker) (Noctuidae: Lepidoptera) is an important pest of cotton as defoliator. It also causes damage to brinjal and sonchal. Actia monticola Mall (Tachinidae: Diptera) is potential biocontrol agent of above pest as an internal larval parasitoid. In the field, it causes about 20-27 per cent mortalies in larval stage. Therefore, hoping the biological control of T. notabilis biology of A. monticola has been worked out. Present work will also add great relevance in developing mass rearing technique of this parasitoid. Review of literature indicates that Beeson and Chatterjee (1935), Datta & Mukherjee (1978), Patil & Govindan (1984), Sathe & Jadhav (2001), Sathe (2012), Shendage & Sathe (2014), Sathe et al. (2014), etc. worked on biology and biocontrol aspects of Tachinid flies from India.

MATERIALS AND METHODS:

Initial culture of parasitoid and pest was started in the laboratory by collecting larvae of T. notabilis from cotton fields. Field collected larvae were screened for parasitoid in the laboratory by providing cotton leaves. Moths emerged were used for culturing host larvae and the parasitoids screened from the collected larvae were used for the laboratory culture of parasitoids. Newly emerged adults of A. monticola were confined in test tube in a pair (m : f) for mating. After matting, mated 5 females were exposed to 25 larvae of third instars of T. notabilis in a glass cage 25× 25 × 25cm for 6 hours and parasitized larvae were separated from the cage into plastic containers and reared on cotton leaves for further development. Thus, sufficient number of parasitize larvae were obtained. The parasitized larvae were dissected in insect saline at 12hr interval for tracing the life cycle. Larval instars of parasitoid were identified with the help of increase in size of head capsules/ mandibles /spiracle size.

RESULTS

A. monticola showed four distinct stages of life cycle viz, egg, larva, pupa and adult. The life cycle from egg to adult was completed within 13-14 days. Details of life stages of A. monticola are given below.

Fig. 1 Egg of A. Monticola

Freshly laid eggs were hard, white shelled, oblong or elongated and creamy white measuring about 0.50 × 0.20 mm. Eggs were deposited in the host larval body tissues. One or two eggs were deposited in a single host.

Incubation period:

Incubation period was 2-3days but, in cold condition it was prolonged to 4 days. Hatching rate was 60.00 per cent.

Larval period:

The larval period of A. monticola was 6 days. Therewere, there instars in the parasitoid.

First instar:

After hatching the eggs, newly emerged maggots started feeding on internal tissues of T. notabilis larvae. Ten maggots measured for 1.5 mm in body length and were whitish opaque and well segmented and typically tappered towards the anterior and broader posteriorly. This stage lasted for 2days. Head capsule and mandibles averaged for 0.15 mm and 0.03 mm respectively.

Second instar:

Ten maggots of second instar averaged for 3.15 mm and were white opaque and well segmented. As like first instar, second instars were apodous and were tapered anteriorly and broader posteriorly. The parasitoid larvae were found feeding on internal tissues of the host larvae by keeping intact vital organs. Segmentation of parasitoid larvae were more distinct than the previous stage. This stage lasted for 2 days. Head capsule and mandibles averaged 0.35 mm and 0.07 mm respectively.

Fig. 2 Second instar of A. Monticola

The maggots of third instar measured for 4.20 mm in body length. The apodous larvae were well segmented, whitish opaque in colour but, slightly darker and less tapered towards anterior portion than second instar. Posterior end was rounded and broader. Third instar larvae severely damaged host larvae by feeding on their internal tissues and finally broken the body wall of host and escaped for pupation. For pupation, the third instar larva searched suitable place and finally pupated in soil. During the escape from host, parasitoid killed the host by breaking body wall. This instar lasted of 2 days. Head capsule and mandibles averaged 1.30 mm and 0.07 mm respectively in ten individuals.

Fig 3 Third instar of A monticola

Pupa was barrel shaped and rounded at both the ends. Externally segmentations were clearly visible. Ten pupae averaged for 4.50 mm in body length. The pupae were brownish to blackish coloured. The pupal period was 6 days.

Adult:

Adult flies measured for 5.5 mm in body length in females and 5.00 mm in males. Blackish- greyish flies showed four longitudinal black lines on the thoracic region. Dorsally and laterally the flies were decorated by typical chaetotaxy.

Adult longevity:

The adult longevity with 100 % honey was 15 days for males and 18 days for females. In control, parasitoids survived for only two days.

Sex ratio:

The sex ratio (m : f) of laboratory emerged flies was favouring females 1:1.20.

Mating:

Mating occurred during the day time and mostly from 10.00 am to 1.00 am.

Ovipositon:

Preoviposition period was 2 days. Mated females oviposited on third instar larvae of T. notabilis.

DISCUSSION

Devaiah et al. (1993) studied the life cycle and distribution of Uzifly Exorista bombycis (L.) (Tachinidae : Diptera) on Silkworm Bombyx mori L. They reported that E. bombycis was distributed in British India, Shri Lanka, Oriental, Ethiopian and Palaearctic regions of the World. The fly completed 5-8 generations on B. mori in India in a single year. Incubation, larval and pupal periods were 15 hours to 4 days, 4-7 days and 7-8.5 days respectively. The adult males survived for 5 to 15 days and females for 20 to 25 days. In the present study, A. monticola completed its life cycle from egg to adult within 14 days with incubation, larval and pupal periods 2-3 days, 6 days and 6 days respectively under laboratory conditions (25±1°C, 65-70% R.H., 14 hr photoperiod).

Shendage and Sathe (2014) studied the biology of Eucelatoria bryani Sabrosky (Tachinidae: Diptera), a larval parasitoid of Helicoverpa armigera (Hubn.) (Noctuidae: Lepidoptera) under laboratory conditions (25±1°C, 12 hr photoperiod) wherein the life cycle from egg to adult was completed within the range of 15 days to 18 days. Incubation, larval and pupal periods were 3-4 days, 7-8 days and 5-6 days respectively. They reported E. bryani as good biocontrol agent for older instars of H. armigera. In the present study, A. monticola completed its life cycle relatively faster than E. bryani. The sex ratio (m : f) of A. monticola was also favouring the females.

Sathe and Jadhav (2001) studied the life cycle of E. bombycis on B. mori. They reported 32.9 days as a developmental period of the parasitoid from egg to adult under laboratory conditions (25±1°C, 75±3% R.H., 18:6 hr photoperiod) while, Mani (1985) reported 38 days of period for completion of life cycle to the same parasitoid on B. mori. The present from A. monticola immediately mated under laboratory conditions, mostly from 10.00 am to 1.00 pm and oviposited on its host within 2 days. The present findings indicate that the parasitoid is rearable on large scale under laboratory conditions for biological control programme of pests.

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Fig 4 Pupae of A monticola

Fig 5 Adult of A monticola

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