



RESEARCH NOTE

Parasitisation efficiency of *Tetrastichus howardi* Olliff (Hymenoptera: Eulophidae) on *Diaphania pulverulentalis* Hampson (Lepidoptera: Pyralidae) pupae at different depths of soil

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ABSTRACT: A laboratory experiment was carried out to determine the parasitization efficiency of *Tetrastichus howardi* (Hymenoptera: Eulophidae) on the pupae of *Diaphania pulverulentalis* Hampson (Lepidoptera: Pyralidae) at various soil depths. The results showed that the parasitoid successfully parasitized the host pupa at various depths, but the emergence rate was highest (96%) when the pupae were on the top layer of soil, followed by 2cm (90%), 4cm (84%), and 6cm (86%).

Keywords: *Tetrastichus howardi*, *Diaphania pulverulentalis*, parasitoid, mulberry

The leaf roller, *Diaphania pulverulentalis* Hampson (Lepidoptera: Pyralidae), is a serious pest of mulberry (*Morus* spp.), the exclusive food plant of the silkworm, *Bombyx mori* L. In the early stages, larvae of *D. pulverulentalis* inhabit the apical succulent portion of the shoot, leading to its destruction, resulting in stunted growth and affecting a considerable decline in leaf yield of about 12.8% with an average incidence of 21.77% (Rajadurai *et al.*, 2000). Considering silkworms' economic importance and susceptibility to insecticide residue, biologically managing mulberry pests is a sustainable approach. *Tetrastichus howardi* Olliff (Hymenoptera: Eulophidae) is a gregarious endo-pupal parasitoid of lepidopteran pests. The parasitoid exhibited a broad host spectrum with a distinct preference for lepidopteran insects (Baitha *et al.*, 2004, Kfir *et al.*, 1993, Moore and Kfir, 1995).

Tetrastichus howardi parasitizes the larvae, pupae and adults of the sugarcane borer, *Diatraea saccharalis* (Fabricius), with the highest parasitism on the pupae (Pereira, 2015). Further, given its potential to suppress the field populations of several insect pests, economic entomologists have attempted to exploit this parasitoid for the biological management of the lepidopteran pests associated with agricultural crops (Gangadhar, 2009). Apart from *D. pulverulentalis*, a few more lepidopteran pests that account for considerable damage to mulberry include *Spodoptera litura* Fabricius and *Spilosoma obliqua* Walker. Interestingly, all these lepidopteran pests of the mulberry are known to pupate in the soil; hence, it is essential to know to what extent those

pupae at various depths would be searched parasitized by *T. howardi*.

The experiment was carried out in the insectary of the Pest Management Laboratory, CSRTI, Mysore, at a temperature of $25 \pm 2^\circ\text{C}$ and relative humidity of 55-75% during December 2021. The artificial bed was prepared in a rectangular plastic rearing tray (57×38.5×6 cm) using soil and dried leaves. Four treatments with five replications were maintained. The soil was filled to a depth of 6 cm, and *D. pulverulentalis* pupae were placed at depths of 2, 4, and 6 cm and the top layer. In each treatment, 50 pupae of *D. pulverulentalis* were used, and 150 adults of *T. howardi* were released onto the tray, covered with nylon net and allowed up to four days for parasitisation. A cotton swab dipped in 50% honey was provided to serve as food for the parasitoid.

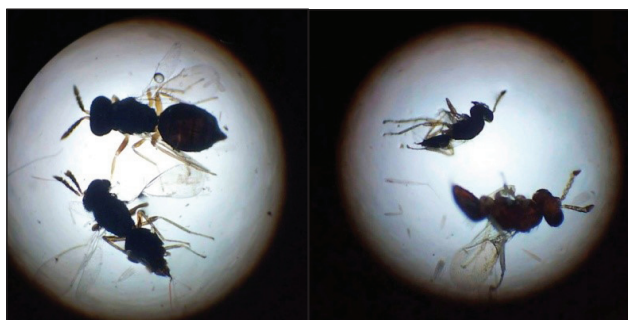


Fig 1. *Tetrastichus howardi* adult female (Left) and male (Right)



Fig 2. Parasitization efficiency of *Tetrastichus howardi* (Hymenoptera: Eulophidae) on *D. pulverulentalis* pupae in different depths of soil

After four days of exposure, *D. pulverulentalis* pupae were collected from the soil at different depths of 2, 4, and 6 cm and the top layer. The pupae were kept in a rearing container till adult *T. howardi* emergence and observation were taken. A comparison of the percentage of *D. pulverulentalis* pupae parasitized by *T. howardi* between treatment groups was made using one-way ANOVA after applying arcsine transformation.

The results (Table 1) revealed that the parasitoid successfully parasitized the host pupa at all depths

without any significant difference. The emergence rate or parasitism recorded was 96% at (top layer), 90% at (2cm depth of soil), 84% (4cm depth of soil) and 86% in (6cm depth of soil). According to our findings, *T. howardi* is confirmed to be an effective parasitoid of *D. pulverulentalis* that can efficiently search the host pupae that are available beneath the soil. So, the parasitoid can be used as a biocontrol component under the IPM of the mulberry leaf roller.

Table 1. Results of comparison of percentage of *D. pulverulentalis* pupae parasitized by *T. howardi*

Soil depth	Mean Parasitism %	Std. Deviation
Top layer	96.00	5.477
2 cm depth	90.00	7.071
4 cm depth	84.00	18.166
6 cm depth	86.00	11.402

F-value (P-value) = 1.255^{ns} (0.323)

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