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Research Note

Parasitising efficiency of the pupal parasitoid, *Tetrastichus howardi* (Olliff) (Hymenoptera: Eulophidae) on *Chilo partellus* (Swinhoe) at different exposure periods

ARUN BAITHA*, S. K. JALALI, R. J. RABINDRA, T. VENKATESAN and N. S. RAO
Project Directorate of Biological Control (ICAR)
Post Bag No.2491. H. A. Farm Post, Hebbal
Bellary Road, Bangalore 560 024, Karnataka, India
Email: arunbaitha@rediffmail.com

ABSTRACT: **Pupae of *Chilo partellus* (Swinhoe) were exposed to one-day-old mated females of *Tetrastichus howardi* (Olliff) for different periods to determine optimum period of exposure for laboratory production. The percentage parasitism varied significantly from 20 to 80 with different exposure periods. The number of parasitoids obtained per pupa (138.0) and females (71%) were significantly higher when pupae were exposure for 12 hours and it decreased significantly on increasing exposure period. Though the per cent parasitism was very low when the pupae were exposed for 12 hours, the number of parasitoids obtained/ 100 pupae was highest (2760). However, considering progeny production and per cent females obtained, 12 hours exposure period is most suitable for avoiding superparasitism in the laboratory production of the parasitoid.**

KEY WORDS: *Chilo partellus*, exposure period, superparasitism, *Tetrastichus howardi*

Reproductive potential of parasitic hymenoptera is affected by many factors, including optimum exposure period of the host to the parasitoid. *Tetrastichus howardi* (Olliff) is a gregarious and polyphagous pupal endoparasitoid with wide host range (Cherian and Subramaniam, 1940; Puttarudriah and Sastry, 1958; Moore and Kfir, 1995). The parasitoid has high net reproductive rate of 99.95 (Jalali and Singh, 2001).

Excessive deposition of its eggs in a single host pupae results in superparasitism. Superparasitism leads to production of stunted, deformed and weak adults (DeBach, 1964). Under laboratory conditions, especially when hosts are exposed to *T. howardi* for a longer period, superparasitism is of common phenomenon. Poor progeny distribution, resulting from superparasitism would adversely influence its production and effectiveness in the field. No information is available on the influence of exposure period on the efficiency of *T. howardi*. Thus, the study was undertaken to determine the parasitising

* Division of Crop protection, Indian Institute of Sugarcane Research, Rae Bareli Road, Dilkusha, P.O., Lucknow 226 002, UP

efficiency of *T. howardi* on *C. partellus* for laboratory multiplication.

Tetrastichus howardi was maintained on the pupae of *C. partellus* at temperature 27±2°C and 60 ±5 per cent relative humidity in the laboratory. Newly emerged mated females were kept singly in test tubes (15x2.5 cm). Each individual female was provided with one pupa of *C. partellus* for various periods of 1, 2, 6, 12, 24, 48, and 72h. The females were fed on fine streaks of honey-water solutions (1:1 v/v). After different hours exposure, the parasitoids were removed from the tube. Each treatment was replicated five times. The observations on per cent parasitism, number of adult parasitoids emerged/pupa, total number of parasitoids obtained/total number of parasitised pupae, developmental period (days), and female progeny (%) were recorded. The data were analyzed by one-way ANOVA and percentage values were transformed to arcsine before analysis.

No parasitisation was obtained at 1-hour exposure period. At higher exposure periods, the percentage parasitism varied from 20 to 80 and there was significant difference between exposure periods (Table 1). The parasitoid spent a long time for selection of host pupae before oviposition, so one hour period was observed to be insufficient for the initiation of parasitism. The number of progeny was maximum (138/pupa) in 12 hours and minimum (20.5/pupa) in 2 hours exposure period. When the host pupa was subjected to prolonged exposure (>12h), number of adults per pupa did not increase significantly. On dissection, such pupae were observed to contain number of partially developed parasitoids. There was no moth emergence when pupae were exposed for more than 48 hours, indicating pupal mortality due to heavy superparasitism (Table 1). Differential mortality during developmental phase has been reported earlier (Flanders, 1946). Developmental period recorded was 18 days in 2 to 12 hours exposure periods compared to 16 to 17 in 24 to 72 hours exposure periods. Developmental period of *T. howardi* has been recorded on different hosts earlier (Cherian and Subramaniam, 1940; Rao *et al.*, 2001; Jalali and Singh, 2001).

Table 1. Different hours of exposure of *Chilo partellus* pupae to *Tetrastichus howardi*

Exposure (Hours)	Parasitisation (%)	Moth emerged(%)	No. of adult parasitoids emerged/	Parasitoid obtained/100 pupae	Developmental period (in days)	Female progeny (%)
1	0.00 (1.3)	100.0	0.0	0.0	0.0	0.00 (1.3)
2	40.00 (39.2)	60.0	20.5	820.0	18.0	25.38 (30.3)
6	20.00 (26.6)	80.0	73.0	1460.0	18.0	43.50 (41.3)
12	20.00 (26.6)	80.0	138.0	2760.0	18.0	71.00 (57.4)
24	80.00 (63.4)	20.0	34.0	2720.0	16.0	36.90 (37.4)
48	60.00 (50.1)	0.0	22.3	1338.0	17.0	10.00 (18.4)
72	60.00 (50.1)	0.0	30.6	1836.0	17.0	6.80 (15.1)
SEM±	4.1	2.3	7.3	5.8	0.004	0.7
CD (P=0.05)	11.8	6.6	21.2	19.3	0.0042	2.1
CD (P=0.01)	16.0	8.9	28.7	20.2	0.0057	2.9

The figures in parentheses are arcsine-transformed values.

Percentage female production was greatest (71) in 12 hours exposure period and it declined significantly with increase in exposure period. The per cent female progeny recorded was 36.9, 10.0 and 6.8 per cent, when pupae were exposed for 24, 48, and 72 hours period, respectively. Decrease in female population due to increase in exposure period has been reported earlier (Alphen and Nell, 1982; Lawrence, 1981). These workers reported that increased daughter mortality on superparasitised host is as an added selective factor favouring increased laying of male eggs on those hosts. However, Puttarudriah and Sastry (1958) and Moore and Kfir (1995) have reported 92-99.5 per cent females in 24 hours exposure period. The female biased sex ratio has been reported when various host pupae were used (Cherian and Subramaniam, 1940; Puttarudriah and Sastry, 1958). However, in the present study per cent females declined with increase in exposure period. Sex ratio is generally known to be highly variable in the parasitic Hymenoptera (Clausen, 1940; Flanders, 1965). Considering per cent parasitism, 24 hours exposure period was found to be suitable for laboratory production of *T. howardi* and to avoid superparasitism.

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