

Preference of *Hyposoter didymator* (Thunberg) to *Spodoptera litura* (Fabricius) on different host plants

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ABSTRACT

Preference of the exotic parasite *Hyposoter didymator* (Thunberg) to parasitise *Spodoptera litura* (Fabricius) feeding on 8 different host plants was studied in the laboratory. In a no-choice test, maximum preference was for host larvae on castor and beetroot, followed by tobacco cv. Xanthi, cauliflower, cowpea, okra and cabbage. Larvae on tobacco cv. Jayashri remained unparasitised in both no-choice and multi-choice tests. Per cent parasitism obtained on the host plants (except tobacco cv. Jayashri) by multi-choice test was statistically similar. Per cent adult emergence was higher on cabbage, cauliflower, castor and beetroot than on other host plants. However, the food plants of the host seemed to have no effect on the developmental time and sex ratio of the progeny.

Key words: *Hyposoter didymator* preference, *Spodoptera litura*.

Hyposoter didymator (Thunberg) (Hymenoptera: Ichneumonidae) has been recorded as an important parasite of various pests of agricultural crops in Czechoslovakia (Birova, 1973), Bulgaria (Tsalbukov, 1973), Israel (Bar *et al.*, 1979) and Azerbaijan (Aliev, 1981). This biocontrol agent was introduced into India in 1985 by arrangement with the CAB International Institute of Biological Control, Switzerland, by the All India Co-ordinated Research Project on Biological Control of Crop Pests and Weeds, for conducting trials against polyphagous pests like *Spodoptera litura* (Fabricius) and *Heliothis armigera* (Hubner). Food plant is known to affect host selection by the parasites

in several ways (Vinson, 1976). Therefore, it was essential to investigate whether *H. didymator* would accept *S. litura* while it feeds on different food plants.

MATERIALS AND METHODS

Eight different host plants viz., beetroot, cabbage, castor, cauliflower, cowpea, okra and tobacco cv. Xanthi and Jayashri were raised in earthen pots measuring 30 cm in height. When the plants were 7 to 8 weeks old, separate bouquets were prepared out of the leaves of each food plant by inserting them in small plastic containers with water.

Host culture of *S. litura* was maintained in the laboratory on an artificial diet developed by Nagarkatti and Satyaprakash (1974) for *H. armigera*. Sets of newly hatched

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larvae were fed on different food plants. Such larvae (which were acclimatised to a particular host plant), when they were 4-5 days old were released on the bouquet of the plants on which they were raised. *H. didymator* was reared on 4-5 day old *S. litura* larvae in the laboratory. Mated female parasites were utilised for the experiment after allowing a pre-oviposition period of two days.

The experiments were conducted at $26 \pm 2^\circ\text{C}$ and 50-60% RH. The host plant preference of *H. didymator* was studied by utilising two experimental methods:

1. No-choice test: In this method, 25 host larvae, which were restricted to a single host plant were exposed to a mated parasite in a wooden cage measuring 30 x 30 x 30 cm for 24 h. After exposure, the larvae were removed and reared individually. Cocoon formation, percent adult emergence, developmental time and sex ratio were recorded in order to determine the effect of different plants on the above

parameters. This test was repeated for all the 8 host plants and each treatment was replicated thrice.

2. Multi-choice test: In this method, all the eight plants with 25 host larvae on each were placed together in a cage measuring 90 x 60 x 25 cm, and 8 mated parasites were released into the cage. All the other steps involved and observations recorded were similar to those in no-choice test.

RESULTS AND DISCUSSION

Innumerable studies including those by Natskova (1984) and Sengoca and Gerlac (1984) proved that some parasites behaved in accordance to the food plants of their hosts, while Boling and Pitre (1971) and Esmaili and Wilde (1972) observed that plants had no discernible effect on parasitism.

Table 1 shows that in no-choice test, maximum per cent parasitism by *H. didymator* was obtained on castor (66.7) and beetroot (65.3) followed by tobacco cv. Xanthi (50.3), cauliflower (48.3) and cowpea (36.2).

Table 1. Effect of host plants on parasitising efficiency of *H. didymator*.

Host plant	Per cent* parasitism		Developmental time ** (days)	Per cent* adult emergence	Sex-ratio ** ♂:♀ (M:F)
	No-choice test	Multi-choice test			
Castor	66.7 a	47.7 a	13.7	84.8 ab	1:0.72
Beetroot	65.3 ab	61.0 a	14.7	79.6 b	1:0.85
Cauliflower	48.3 b	39.5 a	13.3	86.2 ob	1:0.10
Cowpea	36.2 bc	34.4 a	14.0	72.3 b	1:0.66
Okra	33.6 c	48.3 a	15.0	63.1 b	1:0.26
Cabbage	22.8 c	55.1 a	15.0	95.0 a	1:0.06
Tobacco cv.Xanthi	50.3 b	55.4 a	15.0	60.3 p	1:0.76
Tobacco cv.Jayashri	0.0 d	0.0 b	—	—	—

*Treatment means followed by the same letter are not statistically different by L. S. D. test

**Difference between the means not significant.

Parasitism was further reduced on okra (33.6) and cabbage (22.8). It was observed that tobacco cv. Jayashri was the only plant where there was no parasitism. It was interesting to note that caterpillars on tobacco cv. Xanthi were attacked but not on tobacco cv. Jayashri though both had hairy leaves. *S. litura* larvae reared on the latter were smaller than those reared on other host plants which could have caused the rejection by the parasites.

Parasitism obtained on different host plants in the multi-choice test was statistically on par ($P=0.05$) (except tobacco cv. Jayashri), ranging from 34.4 on cowpea to 61.0 on beetroot. However, *S. litura* larvae on tobacco cv. Jayashri remained unparasitised (Table 1). When all the eight plants with *S. litura* larvae on them were placed in the same cage, the parasites were attracted even to the plants which were found to be less preferred in no-choice test. This could have been due to the close proximity of the preferred plants in the cage. This is in conformity with the observations made by Read *et al.* (1970).

Though the lowest parasitism was recorded on cabbage in the no-choice test maximum adult emergence was from this plant (95.0%). There was a gradual decrease in adult emergence from cocoons obtained on cauliflower, castor and beetroot while it was further reduced on cowpea, okra and tobacco cv. Xanthi. The food plants of *S. litura* seemed to have no significant effect either on the developmental time of *H. didymator* or on the sex-ratio.

Considering both per cent parasitism and adult emergence, *H. didymator* seemed to have a marked

preference for *S. litura* on castor and beetroot. The above study clearly shows the role played by food plants of *S. litura* on parasitism by *H. didymator*.

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REFERENCES

- Aliev, A. A. 1981. Toward the knowledge of the fauna of Ichneumonids (Hymenoptera, Ichneumonidae) of Azerbaijan. *Trudy Vsesoy Entomol. Obshch.*, **63**, 108-110.
- Bar, D., Gerling, D. and Rossler, Y. 1979. Bionomics of the principal natural enemies attacking *Heliothis armigera* in cotton fields in Israel. *Environ. Entomol.*, **8**, 468-474.
- Birova, H. 1973. On the knowledge of the natural enemies (Hymenoptera and Diptera) of some injurious noctuids. *Biol. Prace*, **19**, 79.
- Boling, J. C. and Pitre, H. N. 1971. Host plant preference for oviposition by *Trichoplusia ni* and efficiency of *Apanteles marginiventris* as a population regulator of *T. ni* in field cage tests. *J. Econ. Entomol.*, **64**, 411-412.
- Esmaili, M. and Wilde, G. 1972. Behaviour of the parasite *Aphelinus asychii* in relation to the greenbug and certain hosts. *Environ. Entomol.*, **1**, 266-268.
- Nagarkatti, S. and Sathyaprakash. 1974. Rearing of *Heliothis armigera* (Hb.) on artificial diet *Tech. Bull. Commonwealth Inst. Biol. Control*, **17**, 162-173.
- Natskova, V. 1984. Mass rearing of *Encarsia formosa*. *Rast. Zashch.*, **32**, 16-18.
- Read, D. P., Fenny, P. P. and Root, R. B. 1970. Habitat selection by the aphid parasite *Diaetriella rapae* (Hymenoptera: Braconidae) and hyperparasite *Charips brassicae* (Hymenoptera: Cynipidae). *Can. Entomol.*, **102**, 1567-1578.
- Sengoca, C. and Gerlac, S. 1984. The influence of leaf surface features on the effectiveness of the predatory thrips. *Scolothrips longicornis* (Thysan. Thripidae). *Entomophaga*, **29**, 55-61.
- Tsalbukov, P. 1973. Integrated plant protection for mint and lavender. *Rast. Zashch.*, **21**, 11-13.
- Vinson, S. B. 1976. Host selection by insect parasitoids *Ann. Rev. Entomol.*, **21**, 109-133.