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Ovipositional studies of *Bracon hebetor* Say, on two host insects under laboratory conditions

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Abstract : A host (*Corcyra cephalonica / Maruca testulalis*) parasitoid (*Bracon hebetor*) ratio of 2:1 was found to result in higher parasitisation, though the production of females was equal in all the ratios tried. Parasitisation was found to be higher in fourth instar larvae in both the host insects. Three mated female parasitoids per ten host larvae resulted in the best utilisation of the larvae supplied as became evident from the relatively high parasitisation and production of female parasitoid.

Key words : Corcyra cephalonica, Maruca testuialis, Host density, Parasitoid density, Parasitisation, Bracon hebetor.

Introduction

The spotted borer, *Maruca lestulalis* (Geyer) is a serious pest of grain legumes from vegetative to reproductive stage and is responsible for causing considerable yield loss. Except the records of a few parasitoids and predators, no attempts have been made on the biological control of *M testulalis*. *Bracon hebetor* (Say) is a small braconid that paralyses almost all lepidopterous pests. Sosomma Jacob *et al.* (1980) observed highest progeny production at a host density level of two heavy (30-35 mg) larvae of *Corcyra cephalonica* (Stainton) per female of *Bracon brevicornis* Wesm.

Mathew *et al.* (1980) reported that the over production of males in *B. brevicornis* could be remedied effectively by providing 2 to 6 male parasitoid with each female parasitoid at the time of parasitisation of host larvae. Sosomma Jacob *et al.* (I 980) reported highest number of females of *B. brevicornis* at the parental sex ratio of 1 female : 3 males. Sharma and Sarup (1982) reported the preference of larvae of the maize stalk borer, *Chilo partellus* (Swinhoe) by *B.hebetor and B. brevicornis* as compared to the larvae of *C. cephalonica*, an established laboratory host. The information on the ovipositional studies of *B. hebetor* with *M. testulalis* as the host insect is lacking and hence the study was taken up.

Materials and Methods

C. cephalonica larvae were kept on muslin cloth covered with another cloth to restrict the larval movement and offered for parasitisation. To study the influence of host larval density a series of 2, 4, 6, 8, 10 and 12 full grown larvae each were exposed to a single mated female parasitoid confined in the cage by muslin cloth. Ten larvae in each of the first, second, third, fourth and fifth instar of *C. cephalonica* were offered separately to three mated females of the parasitoid confined in the cage to record the influence of host larval instars. To see the influence of adult parasitoid density, study was conducted in rearing cages by exposing ten full grown larvae of *C. cephalonica* each to a series of mated females of 1, 2, 3, 4, 5 and 6 parasitoid density levels per cage.

In each of the three experiments the host larvae were exposed to parasitoid for a period of two days. Later the parasitised host larvae were observed under microscope to note the total number of eggs laid on the body surface in a period of two days. The larvae are then transferred to filter paper placed on glass tube for the development of the parasitoid. The total number of emerging adults and their sex were recorded from each set of observations. The experiment had four replications.

Similar studies were conducted with larvae of *M. testulalis* provided with lablab flower buds and pods as food material to prevent cannibalism.

Results and Discussion

Two host larvae per female parasitoid resulted in cent per cent parasitisation. At higher host larval density, though there was a decline in parasitisation, percentage of parasitisation increased with increase in host larval density

Table 1. Influence of host larval instars on parasitisation by *B.hebetor*#

Host larval instar	Percentage parasitisation*		Eggs laid**		Progeny produced**			
					Males		Females	
	Corcyra	Maruca	Corcyra	Maruca	Corcyra	Maruca	Corcyra	Maruca
Ist	2.87d (0.00)	2.82d (0.00)	0.71e (0.00)	0.71d (0.00)	0.71e (0.00)	0.71d (0.00)	0.71e (0.00)	0.71d (0.00)
2nd	46.51c (52.50)	2.87d (0.00)	6.78cd (45.50)	0.71d (0.00)	3.57cd (12.25)	0.71d (0.00)	2.39cd (5.25)	0.71d (0.00)
3rd	80.90a (100.00)	27.13c (25.00)	7.92c (65.25)	2.93c (9.75)	4.08c (16.25)	1.99c (4.00)	2.81e (7.75)	1.57c (2.25)
4th	80.90a (100.00)	55.44a (67.50)	10.18a (104.00)	7.03a (49.00)	7.68a (59.50)	5.18a (26.50)	5.68a (32.00)	3.80a (14.75)
5th	67.50b (86.00)	43.56ab (47.50)	10.02ab (101.75)	5.42b (29.50)	7.29ab (53.00)	3.47b (12.25)	5.27ab (29.00)	3.46ab (11.50)

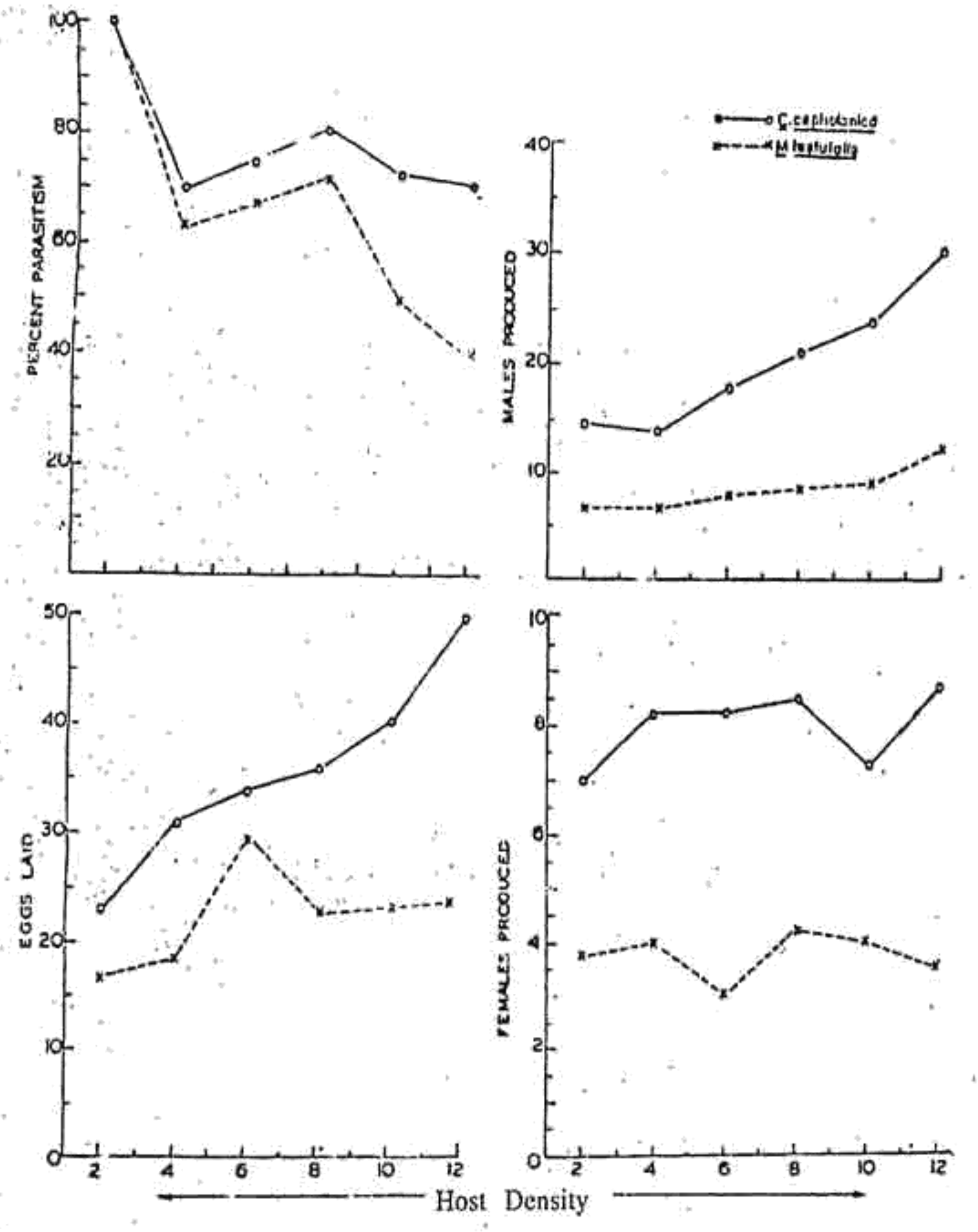
Mean of four replications; * arc sine values; $**\sqrt{x + 0.05}$ values
Figures in parenthesis are original values
In a column means followed by a common letter are not significantly different at 5 % level by DMRT.

Table 2. Influence of *B.hebetor* adult density on parasitisation#

Adult parasite density	Percentage parasitisation*		Eggs laid**		Progeny produced**			
					Males		Females	
	Corcyra	Maruca	Corcyra	Maruca	Corcyra	Maruca	Corcyra	Maruca
One female	49.39c (57.50)	37.66e (37.50)	7.22c (53.00)	5.76f (33.25)	3.63c (13.75)	3.21f (10.50)	3.49cde (12.50)	3.06bcd (9.50)
Two females	65.84b (82.50)	43.56de (47.50)	8.89de (79.25)	6.99e (49.00)	5.92abcd (37.00)	4.34bcd (19.00)	4.19bc (17.50)	3.12bcd (9.75)
Three females	78.57a (97.50)	49.45cd (57.50)	11.02abc (122.25)	9.17d (84.25)	6.71a (47.50)	5.21ab (27.25)	5.64a (32.00)	3.77a (14.00)
Four females	80.90a (100.00)	56.95c (70.00)	11.43a (130.75)	10.42a (108.75)	6.74a (46.00)	5.32a (28.75)	4.44b (20.00)	3.12bc (9.50)
Five females	80.90a (100.00)	69.54b (87.50)	11.28ab (127.25)	10.19ab (104.00)	5.65ab (46.00)	4.52abc (20.50)	4.05bcd (16.50)	2.85bcde (8.25)
Six females	80.90a (100.00)	80.90a (100.00)	10.80abcd (117.00)	10.13abc (103.25)	6.1abc (39.25)	4.33bcde (19.25)	3.95bcde (15.75)	2.63bcde (7.00)

Mean of four replications; * arc sine values ; $**\sqrt{x + 0.05}$ values
Figures in parenthesis are original values
In a column means followed by a common letter are not significantly different at 5% level by DMRT

Fig.1 Influence of host larval density



at four, six and eight larvae per female parasitoid and declined at larval densities higher than eight (Fig.1). The number of eggs laid and production of male progeny increased with increase in host larval density but the production of female progeny remained constant irrespective of host density. The increased fecundity at high host density levels might be partly due to the increased ovipositional sites (Flanders, 1946) and partly due to the increase in the availability of food for the female parasitoid (Ullyett, 1943; 1945). Lower fecundity at low host larval density might be due to the fact that the female parasitoid spent more time in searching than in ovipositing (Odebiyo and Oatman, 1977). Seshagiri Rao *et al.* (1967) reported that the number of host larva of *C. cephalonica* provided had no effect on the female progeny of *B. brevicornis* and the results of the present studies were in unison with this report.

Percentage of parasitisation, number of eggs laid and progeny produced were relatively high in fourth instar larvae of *C. cephalonica and M. testulalis* followed by fifth instar larvae (Table 1). Subba Rao *et al.* (1974) also reported that fecundity of *B. hebetor* was highest in six-weeks old larvae (6th instar) of *Nephantis serinopa* Meyr. As the host larval instars progressed, the larvae became bigger in size with increased body weight. The variation in the trend of production of progeny concomitant with host weight changes was probably due to differential impact of these conditions on the host nutritional status indicated by host weight (Sosamma Jacob *et al.* 1980).

Percentage of parasitisation increased with increase in parasitoid density (Table 2). High fecundity and male progeny were obtained at 4 : 10 ratio of parasitoid to host but ratios exceeding this had registered a declining trend in respect of these parameters. Numerically very high female progeny was obtained at 3: 10 ratio which had decreased at ratios exceeding this. Sharma (1956) recorded that fecundity declined with the increase in density of parasitoid population of *B. brevicornis,* while Sundaramurthy (1979) reported that a ratio of 1:4 host to parasitoid caused cent per cent mortality in *N. serinopa by B. brevicornis.* In the present studies, very high parasitisation by *B. hebetor* was obtained at 2.5 : 1 host to parasitoid ratio irrespective of the host insects tested.

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