

EFFECT OF MULTIPLE PARASITISM OF *ELDANA SACCHARINA* (LEPIDOPTERA: PYRALIDAE) ON THE OFFSPRING OF *PARATHERESIA CLARIPALPIS* (DIPTERA: TACHINIDAE)

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Abstract

Since March 1985, the insect unit at the South African Sugar Association Experiment Station has reared *Paratheresia claripalpis* Wulp. (Diptera: Tachinidae) a potential biocontrol agent of *Eldana saccharina* Walker (Lepidoptera: Pyralidae). Good pupal yields of *P. claripalpis* have been obtained in the laboratory but adult emergence from these puparia was often low. A possible cause was related to multiparasitism (the number of parasitoid offspring produced per host). This phenomenon was investigated by comparing the mass of individual parasitoid puparia produced, their emergence, and the number of maggots produced per female from single and multiple parasitism. When single puparia were obtained from the host insect, they were heavier than when more than one were obtained. However, the numbers of adults obtained, mortality after 14 days, and fecundity were not significantly different.

Introduction

Paratheresia claripalpis Wulp is native to Trinidad and the American continent from Mexico to Peru and northern Argentina, and is used successfully in biological control programmes against sugarcane stalk borers in these regions (Bennett, 1969). In 1985, *P. claripalpis* was imported from Brazil by the South African Sugar Association Experiment Station, for rearing on eldana larvae and subsequent release into cane fields for the control of eldana borer (*Eldana saccharina* Walker). Good pupal yields have been obtained in the laboratory (Conlong, 1992) but adult emergence from these puparia has recently declined. Usually one or two, but as many as five siblings may develop within a single host. Pupal size varies depending upon the number of offspring developing within a single host. Possibly the smaller parasitoids resulting from multiple parasitism of a single host are too weak to emerge from their puparia, or if they emerge are not strong enough to complete their life cycle. The effects of these phenomena on *P. claripalpis* rearing were investigated.

Materials and method

The facilities used to rear *P. claripalpis* are described in detail by Conlong and Graham (1988), and the rearing method is outlined by Kfir *et al.*, (1989) and Anon (1991).

Puparia mass

Parasitoid puparia were harvested 14 days after introduction to host insects, and sorted into four categories dependent on whether one, two, three or more puparia had developed within a single host. The mass of the puparia in each of these categories was obtained and averaged.

Emergence

Each category of puparia was held separately in plastic containers (170 × 270 × 90 mm). When the first offspring emerged the puparia were transferred to black perspex emergence boxes (250 × 200 × 120 mm) with clear plastic vials inserted into apertures on one side of the box. The emerging flies were attracted to the light and were caught in the clear vials. They were counted, sexed, and females were mated with one day old males in clear perspex mating cages (300 × 300 × 300 mm). A 1:1 sex ratio was used (25 females/box). The chance of sib mating was reduced by colour coding the daily inoculation batches and not mating offspring from batches of the same colour. Twenty-four hours later, *P. claripalpis* females were transferred to cylindrical muslin cages (250 mm diam × 250 mm length) for the 14 day gestation period (10 per cage). These were held in a controlled environment room at 26 ± 2 degrees celsius, 75 ± 5% relative humidity, and an eight hour light and 16 hour dark schedule. The females were fed three times a week on agar impregnated with honey and sugar. Water was provided in 20 ml vials with cotton-wool wicks inserted into the lids. Shredded paper provided perches for the flies.

Inoculation

Fourteen days after emergence, the uteri of individual gravid females were dissected under a stereo dissecting microscope to expose active maggots (black mouth-hooks visible). An estimated 100 active maggots were exposed to 100 fourth to sixth instar eldana larvae for one hour in round ventilated containers (125 mm diam × 70 mm deep). Fly maggots were allowed to develop inside their host larvae, which were placed into multicell trays containing eldana diet medium.

Results and discussion

Puparial mass

The heaviest puparia developed singly and the mass decreased as more fly maggots completed development within a single host (Table 1).

Table 1

Mean mass of *P. claripalpis* puparia reared from maggots developing singly or with siblings within a single eldana larva

Number puparia/host (category)	Number massed	Mean mass (mg)	S.D.
1	8 773	34,5	2,7
2	6 432	28,7	2,0
3	2 736	26,1	1,8
4	950	24,8	3,2

Table 2
Comparison of the number of *P. claripalpis* adults that emerged from the three puparial categories

Category	Number puparia	Emerged		Deformed		% Emerged
		Female	Male	Female	Male	
1	8 773	2 157	2 227	172	4	52,0
2	6 432	1 746	1 651	95	5	54,4
3 & 4	3 686	986	970	95	12	55,2

Table 3
Inoculation results using *P. claripalpis* from the three puparial categories

Puparia/ host (category)	Females used	% Mortality	% Unmated	% Mated		Hosts inoculated	Maggots/ female
				% undev. maggots	% dev. maggots		
1	816	71,32	0,12	10,42	18,14	5 170	35
2	531	70,05	0	10,55	19,40	3 725	36
3	343	69,68	0	15,45	14,87	1 850	36

Puparial mass and % emergence

Category 3 and 4 (Table 1) constituted only 20% of the total puparia harvested. They were thus combined into one emergence cage. Percentage emergence in all categories was low (mean = 50%, range 16-93%) (Table 2) when compared with 68,1% in 1990-91 (Conlong, 1992). There were no significant differences between categories, and there was no correlation between puparial mass and the number of adults emerging in all categories.

Inoculation

The inoculation results from the three categories were similar. Flies developing from single parasitism produced the same number of maggots as those from multiple parasitism. The mortality during gestation of *P. claripalpis* was high in all categories (mean = 70%, range 11-100%). Only one female was unmated. Some 10-15% of the females contained undeveloped maggots (Table 3).

Conclusion

The above results show that a single puparium produced from a single host is significantly heavier than when more

than one puparium are produced per single host. However, this aspect did not have any effect on adult emergence, mortality or fecundity between the puparial categories. Selecting heavier puparia will thus not improve the laboratory rearing of *P. claripalpis*.

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