

**The potential of two species of egg  
parasites for controlling *Heliothis*.**

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**INTRODUCTION**

The cotton bollworm (*Heliothis armigera*) is a major pest of cotton in Australia. Concern about insecticide resistance has resulted in the search for alternative methods of bollworm control. One such method involves the use of egg parasites.

Egg parasites of the genus *Trichogramma* are used to control lepidopterous pests throughout the world (Stinner, 1977). These small parasitic wasps are released in large numbers (e.g. 100,000/ha) to oviposit in *Heliothis* eggs. The developing wasp larvae consume the contents of the *Heliothis* egg, thereby killing the pests before they hatch.

The use of *Trichogramma* in pest control generally involves the mass release of whatever species of egg parasite that is available in adequate numbers. Recently (e.g. Pak and Heiningen, 1985; Pak et al., 1986), the importance of selecting a species/strain that is suited to the climatic conditions of the release region has been highlighted. Variation is known to occur between the host

searching ability (Biever, 1972; Boldt, 1972), host preference (Oatman et al., 1968), fecundity (Kfir, 1982), seasonal abundance (Thorpe, 1984), habitat preference (Thorpe, 1985) and temperature adaptability (Pak and Heiningen, 1985) of different species/strains of *Trichogramma*.

The Queensland Department of Primary Industries (QDPI) is currently studying native egg parasites of *Heliothis* in cotton. Attention is being focussed on identifying the basic biological and ecological characteristics of each species with the aim of selecting one or more species/strains that display the greatest potential for use in future *Heliothis* control programs.

The data presented in this paper illustrates the difference in fecundity between two species of egg parasites, and was analysed by analysis of variance.

#### **MATERIALS AND METHODS**

*Trichogramma* (*Trichogrammanza*) sp. and *Trichogrammatoidea* *bactrae* (Hymenoptera: Trichogrammatidae) were reared on *Heliothis* spp. eggs in the laboratory at 25°C and 75% R.H.. The *Trichogramma* parental stock was collected at Brookstead on the Darling Downs, and the *T. bactrae* stock was collected at Biloela.

Individual newly emerged, mated females were placed into small glass vials (25 x 50 mm) containing *Heliothis* eggs that had been oviposited on paper towelling. A small amount of honey was smeared on the gauze lid of each vial as food for the adult female

parasite. Each vial was labelled to identify the female, species and date. Each female was removed from the glass vial after 24 hours and transferred to another glass vial containing fresh *Heliothis* eggs. This procedure was repeated until each female died. It was therefore possible to determine the number of *Heliothis* eggs parasitized by a female on each day of her life.

Host eggs turn black approximately three days after being parasitized, and *Trichogrammatids* take about ten days to develop at 25° C. Individual parasitized eggs were cut from the paper towelling and placed in clear gelatin capsules. The number of eggs parasitized, and the number and sex of emerging parasites were recorded.

#### RESULTS AND DISCUSSION

The mean longevity of *Trichogramma* (6.091 days) was significantly higher than that of *T. bactrae* (2.750 days). *Trichogramma* parasitized significantly more *Heliothis* eggs than *T. bactrae*, and produced significantly more female offspring (tables I and II). *Trichogramma* parasitizes almost as many hosts and produces as many female offspring during the first day of its life, as *T. bactrae* does during its entire lifetime.

These results are similar to those reported for other species, e.g. 40.22 female offspring/female/lifetime for *Trichogramma confusum* (Nagarkatti and Nagaraja, 1978), and 15.8 for *Trichogrammatoidea lulea* (Kfir, 1982).

Trichogramma live longer, parasitize more *Heliothis* eggs and produce more offspring than *Trichogrammatoidea bactrae*, suggesting that they may have a greater potential for biological control. However, fecundity is only one of the parameters being investigated by the QDPI. A full assessment of the potential of both species can only be made when data on host searching ability, host preference, temperature adaptability and insecticide resistance is analysed.

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TABLE I. \*

The fecundity of *Trichogrammatoidea bactrae* parasitizing eggs of *Heliothis armigera*.

| Age Class<br>(days) | Mean number of<br>eggs parasitized<br>per female | Mean number of offspring<br>per female |         |
|---------------------|--|--|---------|
|                     |  | MALES                                  | FEMALES |
| 0-1                 | 3.500 a  | 1.600 a                                | 5.100 a |
| 1-2                 | 3.118 a  | 1.235 a                                | 3.471 a |
| 2-3                 | 4.333 a  | 1.556 a                                | 4.111 a |
| 3-4                 | 5.625 a  | 3.125 a                                | 2.625 a |
| TOTALS              | 16.576   | 7.516                                  | 15.307  |

TABLE II. \*

The fecundity of *Trichogramma (Trichogrammanza) sp.* parasitizing eggs of *Heliothis armigera*.

| Age Class<br>(days) | Mean number of<br>eggs parasitized<br>per female | Mean number of offspring<br>per female |          |
|---------------------|--|--|----------|
|                     |  | MALES                                  | FEMALES  |
| 0-1                 | 15.909 a   | 6.364 a                                | 15.727 a |
| 1-2                 | 14.636 ab  | 4.182 ab                               | 10.455 b |
| 2-3                 | 9.727 bd   | 2.909 bc                               | 6.455 c  |
| 3-4                 | 6.636 cd   | 3.182 bcd                              | 3.727 cd |
| 4-5                 | 10.400 bd  | 5.500 acde                             | 3.400 cd |
| 5-6                 | 2.333 e  | 1.556 b                                | 0.556 d  |
| 6-7                 | 2.250 e  | 1.250 be                               | 0.750 d  |
| TOTALS              | 61.891   | 24.943                                 | 41.070   |

\* Means in columns followed by the same letter are not significantly different at the 5% level.