Lifespan, parasitism levels and progeny production of *Trichogramma pretiosum* reared on *Helicoverpa armigera* eggs in the laboratory.

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Key Findings

- *Trichogramma pretiosum* parasitised 58 *Helicoverpa armigera* eggs per lifetime in the laboratory. Approximately 10 eggs were parasitised on the first day.
- *T. pretiosum* progeny production was female biased, with over 70% of offspring being females. Each *T. pretiosum* female produced, on average, 51 female offspring in the laboratory. Only female wasps attack eggs.
- *T. pretiosum* females lived for approximately 10 days in the laboratory.

Introduction

Trichogramma pretiosum is a key natural enemy of heliothis (*Helicoverpa* spp.) on the Darling Downs. The data presented here describe some of the biological parameters of *T. pretiosum*, and may be useful in future population models that predict the impact of this valuable egg parasitoid on heliothis. Here we report on the lifespan, parasitism levels and progeny production of *T. pretiosum* reared on *Helicoverpa armigera* in the laboratory.

Methods

The trials were conducted in a constant temperature room at approximately 25 ± 1°C and 60 ± 10% R.H.. The strain of *T. pretiosum* was originally collected from Kununurra (Western Australia) and had been reared in the laboratory for 198 generations on eggs of *H. armigera*.

Newly emerged wasps were isolated as pairs (one male and one female) in a clear gelatin capsule (Parke-Davis No. 100) for 0.5 hour to allow for mating. The females were then removed and isolated individually in small glass vials (25 x 50 mm) capped with gauze lids for ventilation. The lids were provisioned with a smear of honey as food for the females. Fresh laboratory reared *H. armigera* eggs (< 24 hours old) were added to each vial. Each female wasp was relocated to a new glass vial with fresh *H. armigera* eggs after 2, 4 and 6 hours on the first day, and daily thereafter until each female wasp died. There were 24 replicates at the start of the trial, and the number of replicates declined as the females died. The maximum number of replicates (24) were alive for six days. Cumulative data were plotted for days 1-10, as there were less than 10 females alive after the tenth day.

All vials were held in the constant temperature room until the parasitoids had emerged. The numbers of eggs parasitised and progeny produced were counted, and all progeny were sexed. Larvae that hatched from unparasitised eggs were removed daily to prevent them from feeding on parasitised eggs.

Results and Discussion

Female *T. pretiosum* lived for 10.1 days in the laboratory. During this time they parasitised 58.3 *H. armigera* eggs and produced 50.6 female offspring and 20.7 male offspring. Females comprised 72.6% of all progeny.

Pak and Oatman (1982) found that *T. pretiosum* had a lifespan of 10.2 days at 25°C. They conducted their work on cabbage looper, *Trichoplusia ni*, eggs. *T. pretiosum* parasitised 51.3 *T. ni* eggs and produced 50.0 female offspring, with females comprising 77.9% of progeny. These figures are similar to those reported here for *H. armigera.*

The daily levels of egg parasitism and progeny production are shown in Figure 1. Most eggs were parasitised on day 1, and 44% of these were parasitised within the first 2 hours (Figure 1). The levels of egg parasitism generally remained over 5 eggs/day up until day 8, while the production of female progeny declined steadily over time. By contrast, male progeny production peaked on day 1, dropped markedly and then rose steadily (Figure 1), presumably because the sperm supply within the females were gradually declining (*Trichogramma* eggs typically have to be fertilised to produce female offspring). The sex ratio of progeny was female biased for 11 days, and peaked on day 2 (Figure 2).

Strong correlations were found between the numbers of eggs parasitised and progeny production over time (Figure 3), and may be useful in models that predict the impact of *Trichogramma* on heliothis mortality.

Acknowledgements

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References

Pak, G.A. and Oatman, E.R. (1982). Comparative life table, behavior and competition studies of *Trichogramma brevicapillum* and *T. pretiosum*. *Entomologia Experimentalis et Applicata* 32: 68-79.

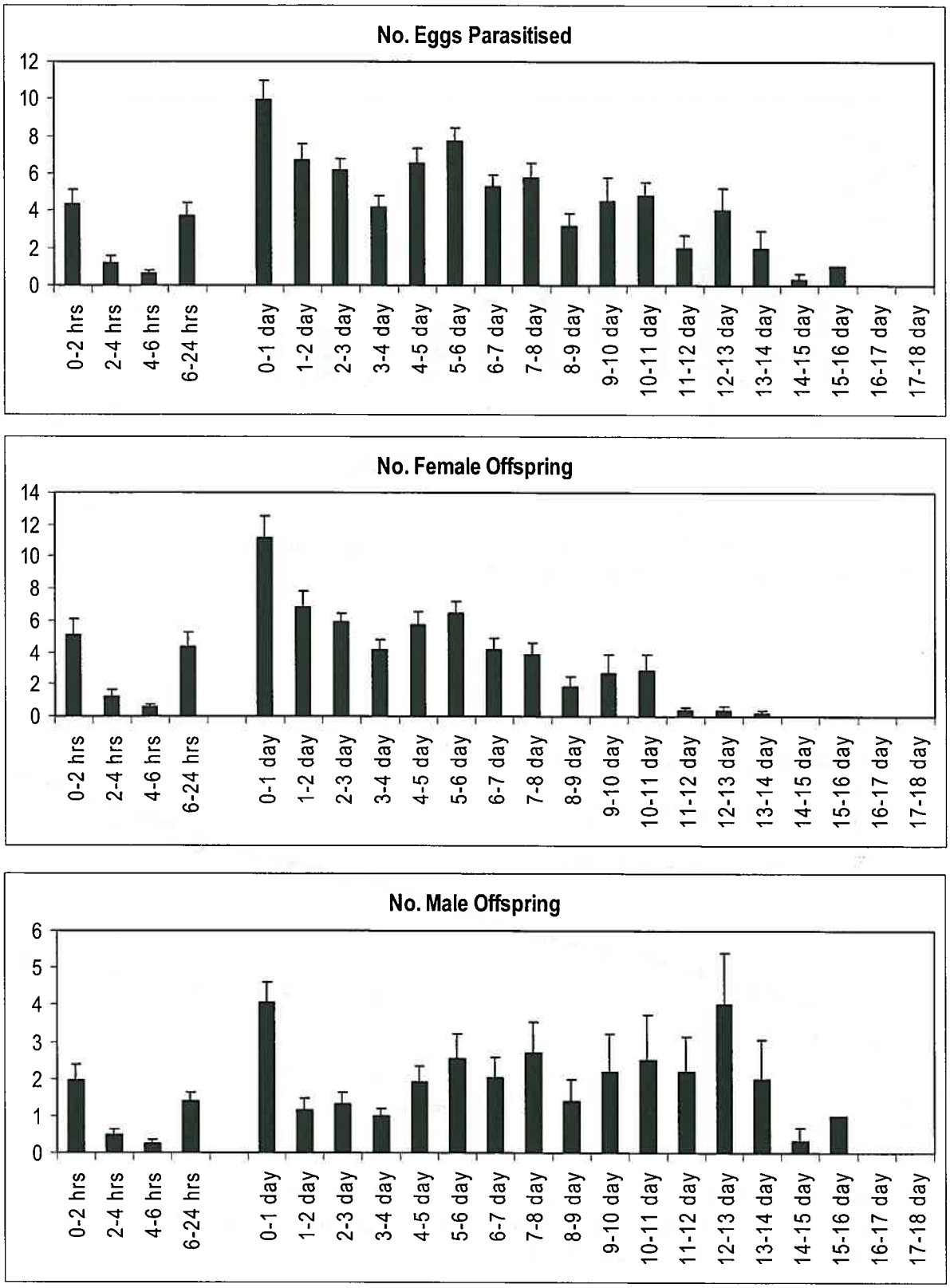

Figure 1: Laboratory biological parameters for *Trichogramma pretiosum* reared on eggs of *Helicoverpa armigera* at 25°C and 60% RH. Data represent the mean ± standard error of a starting study group of 24 females. Day 1 assessments were completed 2, 4, 6 and 24 hours after the females were first given access to eggs. Thereafter the assessments were completed daily.

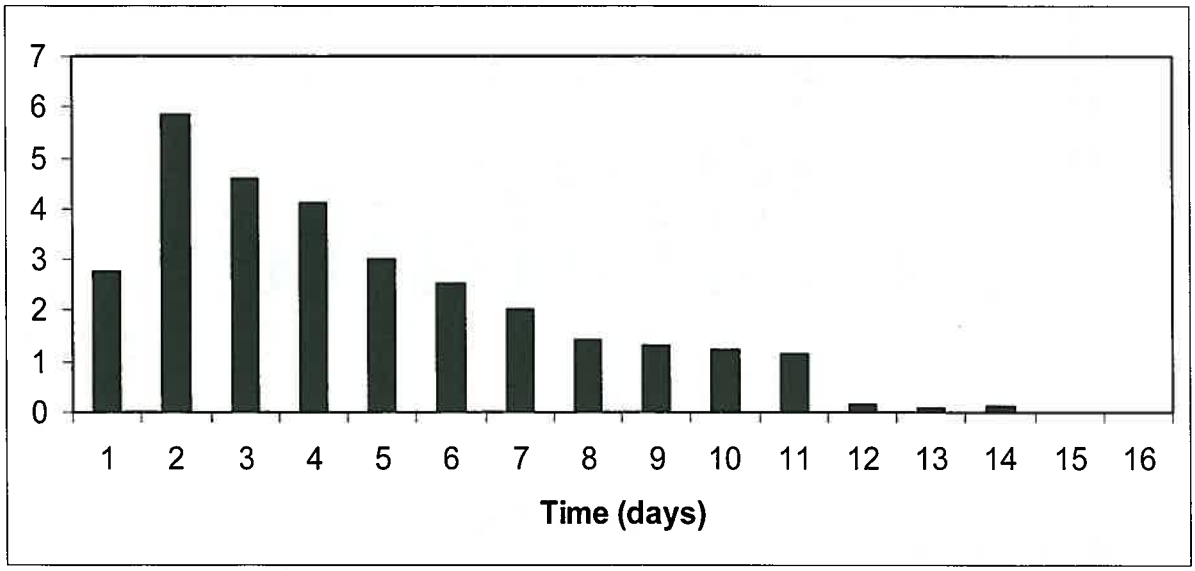

Figure 2: Daily sex ratio (females : males) of *Trichogramma pretiosum* reared on eggs of *Helicoverpa armigera* at 25°C and 60% RH..

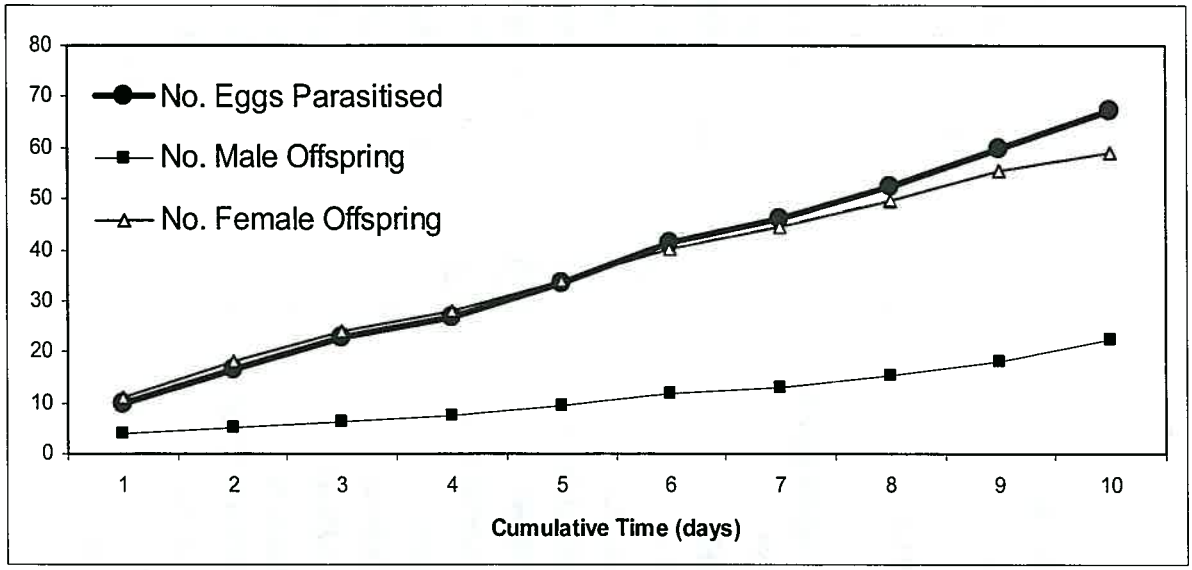

Figure 3: Cumulative parasitism levels and progeny production for *Trichogramma pretiosum* reared on eggs of *Helicoverpa armigera* at 25°C and 60% RH.. The following linear regressions were fitted to the data:

No. Eggs Parasitised	=	6.72 x Time (days)	$r^2 = 0.990$
No. Male Offspring	=	2.05 x Time (days)	$r^2 = 0.959$
No. Female Offspring	=	6.35 x Time (days)	$r^2 = 0.952$

APPENDIX 1

Some basic lifetime biological parameters for *Trichogramma pretiosum* parasitising eggs of *Helicoverpa armigera* in the laboratory at 25°C and 60% RH. Data are the mean ± standard error of *n* samples.

Time	*n*	No. Eggs Parasitised	No. Male Offspring	No. Female Offspring	% Females
0-2 hrs	24	4.4 ± 0.8	2.0 ± 0.4	5.1 ± 1.0	72.9 ± 4.7
2-4 hrs	24	1.2 ± 0.4	0.5 ± 0.2	1.2 ± 0.5	69.9 ± 9.4
4-6 hrs	24	0.6 ± 0.2	0.3 ± 0.1	0.5 ± 0.2	66.0 ± 12.9
6-24 hrs	24	3.7 ± 0.7	1.4 ± 0.3	4.3 ± 0.9	75.6 ± 3.3
0-1 day	24	9.9 ± 1.1	4.0 ± 0.6	11.2 ± 1.3	70.6 ± 4.0
1-2 day	24	6.7 ± 0.9	1.2 ± 0.3	6.8 ± 1.0	85.8 ± 3.5
2-3 day	24	6.1 ± 0.7	1.3 ± 0.3	5.9 ± 0.6	85.6 ± 3.1
3-4 day	24	4.2 ± 0.6	1.0 ± 0.2	4.1 ± 0.6	74.4 ± 5.4
4-5 day	24	6.6 ± 0.7	1.9 ± 0.4	5.8 ± 0.7	74.3 ± 4.5
5-6 day	24	7.7 ± 0.7	2.5 ± 0.7	6.4 ± 0.8	73.7 ± 5.6
6-7 day	23	5.3 ± 0.7	2.0 ± 0.5	4.1 ± 0.8	66.8 ± 7.7
7-8 day	20	5.8 ± 0.8	2.7 ± 0.8	3.9 ± 0.8	63.7 ± 9.5
8-9 day	16	3.1 ± 0.8	1.4 ± 0.6	1.8 ± 0.7	61.7 ± 13.1
9-10 day	10	4.5 ± 1.3	2.2 ± 1.0	2.7 ± 1.1	51.7 ± 18.6
10-11 day	6	4.8 ± 0.7	2.5 ± 1.2	2.8 ± 1.0	53.9 ± 19.3
11-12 day	6	2.0 ± 0.7	2.2 ± 1.0	0.3 ± 0.2	26.7 ± 19.4
12-13 day	6	4.0 ± 1.2	4.0 ± 1.4	0.3 ± 0.3	13.3 ± 13.3
13-14 day	5	2.0 ± 0.9	2.0 ± 1.0	0.2 ± 0.2	16.7 ± 16.7
14-15 day	3	0.3 ± 0.3	0.3 ± 0.3	0 ± 0	0
15-16 day	1	1.0	1.0	0	0
16-17 day	1	0	0	0	
17-18 day	1	0	0	0	
Lifetime	24	58.3 ± 4.4	20.7 ± 3.8	50.6 ±3.8	72.6 ± 3.3
Mean Lifespan (days)	24	10.1 ± 0.6			