

BIOLOGICAL STUDIES ON THE MALACOPHAGOUS INSECT, *RAVINIA STRIATA* (FABRICIUS) (SARCOPHAGIDAE: DIPTERA)

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(Manuscript received 9 June, 1998)

Abstract

The biology of malacophagous sarcophagid, *Ravinia striata*, was investigated at $27 \pm 2^\circ\text{C}$ and R.H. $75 \pm 5\%$ in association with feeding its larvae on the species *Monacha obstructa*. Under these conditions the total larval duration occupied 7.83 ± 0.75 days associated with 25% mortality percent. Through this stage, 16.73 ± 2.42 snails were consumed at a daily consumption rate of 2.14 ± 0.28 individuals. The pupal duration lasted 9.07 ± 0.54 , associated with 6.67% mortality rate. Number of larviposition was 2.75 ± 0.45 giving a total number of 52.58 ± 3.75 larvae. The sex ratio was 3:4 (female : male) and the longevities of the two sexes were 55.08 ± 2.35 and 69.0 ± 5.37 days, respectively.

Key words: Biology, malacophagous; *Ravinia striata*, Snails, *Monacha obstructa*.

INTRODUCTION

Molluscs are important pests of fruit trees, vegetables, medical plants, ornamental plants and field crops in addition to their role as intermediate hosts for many of the parasitic diseases which infect human, animals and birds. Among these snails are *Pomacea* spp. on rice plantations of south and central America (Efferson 1968), *Pomacea conaliculata* on apple trees in Japan (Hirai 1988), other snails observed on sugar cane at Tanzania (Fenwick 1970) and on citrus in Zimbabwe (Medenwald and Shiff, 1965, Shiff *et al*, 1977) In Egypt, land molluscs infest ornamental plants, vegetable, orchard plants and field crops (El-Okda, 1979).

The present work deals with the biology and predatory activity of the sarcophagid *R.striata* as a biological control agent upon certain harmful terrestrial snails in Egypt.

MATERIALS AND METHODS

Rearing of the predator and its prey were carried out by the same technique previously described by Tawfil. *et al* (1996).

RESULTS AND DISCUSSION

Immature Stages

Larval stage: There are three instars in the life-span of the sarcophagid *R.striata*. The newly born first instar larva is small, measuring 1.74 ± 0.17 (1.5-2) and 0.54 ± 0.08 (0.4-0.6) mm in its greatest width. As development proceeded, the size increased gradually to reach 2.51 ± 0.13 (1.9-3.1) mm in body length and 0.76 ± 0.03 (0.6-0.9) mm in body width. The number of the body segments is apparently twelve, the first instar lasted 1.44 ± 0.5 (1-2) days. The body of the second instar larva measures 4.02 ± 1.14 (2.9-6.1) mm long and 1.29 ± 0.23 (0.9-1.5) mm wide. In this instar the duration lasted 2.03 ± 0.17 (2-3) days. The body of the third instar becomes 7.58 ± 0.45 (5.4-10) days.

Consequently, the total larval period averaged 7.83 ± 0.75 days with a range of 7-9 days. It appears that the first larval duration was the shortest, while the third larval duration was the longest. However, mortality in the first larval instar got higher (10%) than in the second larval instar (2.78%), while the mortality reported for the third instar was 14.29%. The total mortality during the larval stage reached 25%.

Pupal stage: The puparium is nearly cylindrical in shape with a slightly tapering ends. Its length ranged from 5.5-6.1 mm with an average of 5.89 ± 0.22 mm, while the width ranged from 2-2.2mm with an average of 2.21 ± 0.08 mm. (from 30 samples). By feeding 40 larvae on *M.obstructa* snails, the pupal period was completed in 9.07 ± 0.5 (8-10) days. Consequently, the pupal mortality rate reached 6.67%.

Adult stage

Emergence: Percentage of emergence of adults of *R.striata* reached 93.33% indicating suitability of *M.obstructa* for rearing this predator.

Sex - ratio: Sex ratio was 3:4 (female : male) being slightly in favour to males.

Longevity: Female life span lasted 55.08 ± 2.35 (49.59) days, while that of the male was 69.0 ± 5.37 (61-76) days, thus, longevity of males is longer than of females.

Mating: The male starts mating with female few hours after emergence. Consequently, it assumes a dorsal position astrided the female with both partners facing in the same direction. The anterior tarsi of the male are placed on the prothorax of the female, while the middle legs are widely spread and down over the leading edge of the slightly spread wings of the female. Hind tarsi grasp her post abdomen and sometimes he pauses on it. The duration of copulation varied from few minutes to over an hour, but usually it took about 65-70 minutes. After copulation, the male is usually refused by the female, but the process is repeated frequently throughout the life of the male.

Fecundity: Fecundity of *R.striata* female was estimated at $27 \pm 2^{\circ}\text{C}$ and $75 \pm 5\%$ R.H. in individuals completed development on the same snail species *M.obstructa*. The prelarviposition period in females ranged from 13-18 days and averaged 15.33 ± 2.02 days. Larvae were laid throughout a period that extended from 26 to 35 days with an average of 31.75 ± 2.93 days at the laboratory conditions mentioned above. The postlarviposition period ranged from 6-10 days with an average of 8 ± 1.28 days, Table 2.

The female deposits her larvae progeny close to snails. After this deposition, the female drives out the egg membranes, and sometimes the female put some eggs instead of larvae as these eggs did not hatch in or outside her body. The egg is creamy white in colour, banana shaped measures 1.48 ± 0.09 (1.3-1.6) mm long and 0.42 ± 0.06 (0.3-0.5) mm wide.

Female reared on *M.obstructa* at $27 \pm 2^{\circ}\text{C}$ and $75 \pm 5\%$ R.H. laid the larval progeny at 2.75 ± 0.45 (2-3) intervals and this progeny consisted of 48-60 individuals (average 52.58 ± 3.75 larvae/female).

Total duration of life cycle (days)	Pre-larviposition period (days)		Larviposition period (days)	Post-larviposition period (days)
	Minimum	Maximum		
13-18	13	18	26-35	6-10
Average	15.33	15.33	31.75	8
Standard deviation	2.02	2.02	2.93	1.28

Table 1. Larviposition records of *R.striata* when feeding the larvae on *M.obstructa* at $27\pm 2^{\circ}\text{C}$ and $75\pm 5\%$ R.H.

Period			No. of Larvi- \ position / female	No. of Larvae/ female
Pre larvi - position period	Larvi - position period	Post larvi - position period		
15.33±2.02	31.75±2.93	8.00±1.28	2.75±0.45	52.58±3.75
(13 - 18)	(26 - 35)	(6 - 10)	(2 - 3)	(48 - 60)
12	12	12	12	12

Consumption: By feeding on *M.obstructa* snails, the first larval instar consumed 1.67 ± 0.84 (1-4) individuals, while the daily consumption rate reported for this instar was 1.15 ± 0.37 (1-2) individuals, Table 2. The respective consumptions reported for the second instar were 3.94 ± 0.34 (2-4) individuals and 1.97 ± 0.17 (1-2) individuals. For the third instar, the consumptions recorded were 11 ± 2.42 (8-15) individuals and 2.6 ± 0.5 (2-3) individuals, respectively. Through the larval stage of this sarcophagid, the total consumption reached 16.73 ± 2.42 (13-21) individuals, while the average daily consumption was 2.14 ± 0.28 (1.67-2.5) individuals. It appears that the rate consumption increases as the larva develops to reach the maximum in the mature larva. A similar trend was observed in the case of daily consumption rate.

Statistically, there is a highly significant differences ($P>0.001$) between consumption of the various instars and also between daily consumption of these instars.

Table 2. Consumption and daily consumption rate of the various larval instars of *R.striata* feeding upon *M.obstructa* at $27\pm 2^{\circ}\text{C}$ and $75\pm 5\%$ R.H.

Consumption	Predation of each instar larva			Total consumption or average daily cons. / total period
	1 st	2 nd	3rd	
Total consumption	1.67 ± 0.84 (1-4) 36	3.94 ± 0.34 (2-4) 35	11.0 ± 2.42 (8-15) 30	16.73 ± 2.42 (13-21) 30
Daily consumption	1.15 ± 0.37 (1-2) 36	1.96 ± 0.17 (1-2) 35	2.6 ± 0.5 (2-3) 30	2.14 ± 0.28 (1.67-2.5) 30

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دراسات بيولوجية علي الحشرة المتغذية علي القواقع
رافينيا سترياتا (ذات الجناحين)

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تم دراسة بيولوجي مفترس القواقع رافينيا سترياتا تحت درجة حرارة 27 ± 2 م ورطوبة نسبية 75 ± 5 % مرتبطة بتغذية اليرقات علي قوقع موناكا اوبستراكتا. تحت هذه الظروف بلغ طول العمر اليرقي 7.82 ± 0.75 يوم وكانت نسبة الموت 25 % وخلال هذه المرحلة بلغ متوسط استهلاك اليرقة 16.73 ± 2.42 قوقعا وكان متوسط الاستهلاك اليومي لليرقة 2.14 ± 0.28 قوقعا، أما فترة طور العذراء فبلغت 9.07 ± 0.54 يوما وإرتبطت بنسبة موت 6.67 % . كان معدل وضع اليرقات للأنثي 52.58 ± 3.75 يرقة وضعت في عدد من المرات 2.75 ± 0.45 . أما النسبة الجنسية فبلغت $4: 2$ (أنثي : ذكر) وبلغ طول عمر الحشرة الكاملة 0.8 ± 0.05 يوما للأنثي و 0.37 ± 0.05 يوما للذكر.