

Biology, age specific fecundity and intrinsic rate of increase of *Goniozus triangulifer* Kieffer (Hymenoptera : Bethyridae), a larval parasitoid of rice leaffolder, *Cnaphalocrocis medinalis* (Guenée) (Lepidoptera : Pyralidae)

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ABSTRACT : Biology of *Goniozus triangulifer* Kieffer (Hymenoptera : Bethyridae) on *Cnaphalocrocis medinalis* (Guenée) revealed the egg-larval period to be 9.05 ± 1.14 days, pupal period 3.65 ± 0.48 days and adult longevity 8.30 ± 1.26 days for males and 11.10 ± 1.77 days for females. Sex ratio was 1:4.30 (M:F). Life table data of the parasitoid indicated that the ovipositing females lived for a maximum of 9 days and increased its population at the rate of 16.40 per generation (R_0) with mean generation time (T_c) of 14.61 days. The intrinsic rate of natural increase (r_m) was 0.193 and the finite rate of increase (λ) was 1.212 females/female/day.

KEY WORDS : Age specific fecundity, biology, *Cnaphalocrocis medinalis*, *Goniozus triangulifer*, intrinsic rate of increase

The rice leaffolder, *Cnaphalocrocis medinalis* (Guenée) is attacked by several parasitoids in larval stage. *Goniozus triangulifer* Kieffer is an important gregarious ectoparasitoid (Litsinger *et al.*, 1987). Laboratory experiments were conducted to study the biology, age specific fecundity and intrinsic rate of increase of *G. triangulifer* on *C. medinalis* to assess the biotic potential of this species.

MATERIALS AND METHODS

Twenty mated females of *G. triangulifer* were placed separately in glass tubes (10 x 2 cm) and were provided with 20 per cent honey solution in cotton swab as food. A single third instar larva of *C. medinalis* was introduced into each tube at 2 h interval for parasitization until the female died. Parasitized larvae were reared

day-wise separately till the emergence of parasitoids. The sex of the progeny and other biological parameters were recorded. The fecundity life table was constructed using the methods suggested by Andrewartha and Birch (1954) and Southwood (1964).

RESULTS AND DISCUSSION

Biological parameters of the parasitoid *G. triangulifer* is presented in Table 1. Unlike parasitoids of many other

families, the males of *G. triangulifer* did not show any excitement in the presence of virgin females. This is because, the number of male progenies developed from the eggs of a single female is very less and that allow the males to mate with many females. Sometimes the males fanned their wings but not as rapidly as of other parasitoid species. The male mounted the female from the rear and held the female with its legs. It assumed copulation position and then tapped the female with

Table 1. Biological parameters of *Goniozus triangulifer* on *Cnaphalocrocis medinalis*

Parameter	Range	Mean* \pm S D
Mating period	17.0 - 36.0 (seconds)	26.00 \pm 5.92
Duration of oviposition	3.0 - 5.0 (seconds)	4.00 \pm 0.79
Egg + Larval period	7.0 - 11.0 (days)	9.05 \pm 1.14
Pupal period	3.0 - 4.0 (days)	3.65 \pm 0.48
Adult longevity		
Male	6.0 - 11.0 (days)	8.30 \pm 1.26
Female	8.0 - 14.0 (days)	11.10 \pm 1.77
Total life span		
Male	16.0 - 26.0 (days)	19.35 \pm 3.18
Female	18.0 - 29.0 (days)	22.65 \pm 3.24
Sex ratio (M:F)	1 : 4 . 30	

* Mean of 20 individuals

its antennae. The female then raised its abdomen and opened the genital pore. The male mated with characteristic wing fanning which lasted for 17 - 36 seconds (mean 26.0 ± 5.92 seconds). A female mated with 3 to 6 males while a male mated with 7 to 12 females. The female wasp first paralyzed the host by stinging it on the dorso-lateral side. Mating and host paralyzing behaviour of this parasitoid was

female on the upper surface of the body. A female laid about 20 eggs during its life span. Legaspi *et al.* (1987), however, reported the fecundity to be 80 eggs / female. The parasitoid larvae were yellowish, globular in shape and fed externally on the host body. The egg-larval period lasted 7 - 11 (mean 9.05 ± 1.14) days. The fully fed larva was found by the side of the dead host larva as a reddish

Table 2. Age specific fecundity and life table statistics of *G. triangulifer* on *C. medinalis*

Pivotal age in days (x)	Age specific longevity (l_x)	Age specific fecundity (m_x)	$l_x m_x$	$x l_x m_x$
1 - 12	Immature stage			
13	1.0	2.85	2.85	37.05
14	1.0	6.45	6.45	90.30
15	1.0	3.80	3.80	57.00
16	0.8	2.38	1.90	30.40
17	0.7	1.14	0.80	13.60
18	0.5	0.60	0.30	5.40
19	0.4	0.38	0.15	2.85
20	0.3	0.33	0.10	2.00
21	0.2	0.25	0.05	1.05

$$R_0 = 16.40, T_c = 14.61, r_c = 0.191, r_m = 0.193, \lambda = 1.212$$

similar to that of *G. nephantidis* parasitizing *Opisina arenosella* (Pillai and Nair, 1985). Oviposition commenced after the host larva was immobilised. The female took 3 - 5 (mean 4.0 ± 0.79) seconds to lay one egg.

On a single host larva usually 3 - 5 (mean 4.14 ± 0.85) eggs were laid by a

brown cocoon. Pupal period lasted 3 - 4 (mean 3.65 ± 0.48) days. Adult males lived for 6 - 11 (mean 8.30 ± 1.26) days, while the females lived for 8 - 14 (mean 11.10 ± 1.77) days. Total life span of the males ranged from 16 - 26 (mean 19.35 ± 3.18) days and those of the females from 18 - 29 (mean 22.65 ± 3.24) days. These observations agree with the observations

of Shepard *et al.* (1987). From a single host larva 3 - 5 parasitoids emerged and sex ratio was 1: 4.3 (male : female). Legaspi *et al.* (1987) had similar observations on this parasitoid.

The age specific fecundity, longevity and life table statistics of *G. triangulifer* is presented in Table 2. The females lived for a period of 9 days (minimum three days). The parasitoid increased its population at the rate of 16.40 per generation (R_0) with mean generation time (T_c) of 14.61 days. The intrinsic rate of natural increase (r_m) was 0.193 and the finite rate of increase (λ) was 1.212 females / female / day.

The r_m value for *G. triangulifer* on *C. medinalis* (0.193) is higher than r_m values for *Goniozus sensorius* Gordh on *Diaphania indica* (0.185) (Peter and David, 1989) and *Goniozus emigratus* (Rowher) on *Amyelois transitella* (Walker), (0.178) (Gordh and Hawkins, 1981), which indicates that it is a more potential parasitoid than the other *Goniozus* species.

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