

Fecundity, Life Tables and Intrinsic Rate of Increase in *Apanteles jayanagarensis* Bhatnagar, A Larval Parasitoid of *Spilosoma obliqua* (Wlk.)

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ABSTRACT

The longevity of ovipositing females of *Apanteles jayanagarensis* Bhatnagar, a larval parasitoid of *Spilosoma obliqua* (Wlk.) ranged from 5 to 8 days ($\bar{X}$ 6.8). The number of progeny produced ranged from 108 to 134 individuals ($\bar{X}$ 119.6). The male:female offsprings ranged from 1:0.95 to 1:2.051 ($\bar{X}$ 1:1.349). The first adult mortality was on the 5th day. The average length of immature stages of parasitoids was 16 days. The maximum mean progeny production per day (mx) was 18.8 on the 2nd day. The intrinsic rate of increase (rm) per female per day was 0.225 and population multiplied 66.71 times in mean generation time of 18.66 days.

KEY WORDS: Life table, *Apanteles jayanagarensis*, larval parasitoid, *Spilosoma obliqua*

Life table studies have been done in different insects by several workers to understand the population ecology (Bilapate and Pawar, 1980) but, very little attention had been given to hymenopterous parasitoids (Chundurwar, 1977; Nikam and Sathe, 1983; Sathe and Nikam, 1984; Sathe, 1986, 1991). *Apanteles jayanagarensis* Bhatnagar (Hymenoptera : Braconidae) is a potent larval parasitoid of *Spilosoma obliqua* (Wlk.) and was described for the first time from India by Bhatnagar (1948). In Maharashtra it showed 18% parasitism in the fields of sunflower and acts as a good biocontrol agent of *S.obliqua* (Ingawale, 1991). In the present study, fecundity, sex-ratio, life tables and intrinsic rate of increase in *A.jayanagarensis* were covered. The data would be helpful for rating the parasitoid in biocontrol programme of *S.obliqua*.

MATERIALS AND METHODS

The life tables in the present study were constructed according to Birch (1948), Howe (1953) and Watson (1964). The parasitoids were reared on 4-day old *S.obliqua* larvae. A constant number of forty host larvae were

exposed to the parasitoids daily for 24 h. The parasitized host larvae were transferred into separate containers for adult formation. Observations were made on the immature forms, longevity of adult parasitoids, sex-ratio and daily emergence of parasitoids from each of the hosts to determine the fecundity. The life tables were constructed with the help of fecundity data and later, the intrinsic rates of natural increase of population of parasitoids were calculated. All the experiments were carried out at laboratory conditions ($22 \pm 1^\circ\text{C}$, R.H. 50-55%). During the experiment, the parasitoids were fed with 50% honey and hosts with sunflower leaves.

RESULTS AND DISCUSSION

Life table statistics is represented in table 1. The longevity of ovipositing females ranged from 5 to 8 days ($\bar{X}$ = 6.8). The number of progeny produced ranged from 108 to 134 individuals ($\bar{X}$ = 119.6). The male : female offsprings ranged from 1:0.95 to 1:2.051 ($\bar{X}$ = 1:1.349). The first adult mortality was on the 5th day. Average length of immature stages of parasitoid was 16 days. The maximum mean progeny production per

Table 1. Life table Statistics of *A.jayanagarensis*

Pivotal age x (days)	Proportional live at age X (l x)	No. of female progeny/female (mx)	$l_x m_x$	$l_x m_x x$
Immature stages 16 days				
17	1	13.1	13.1	222.70
18	1	18.8	18.8	338.40
19	1	16.5	16.5	313.50
20	1	14.3	14.3	286.00
21	0.7	5.3	3.71	77.91
22	0.5	0.6	0.3	6.60
23	0.3	0.0	0.0	0.0
			<u>66.71</u>	<u>1245.11</u>

day 'mx' was 18.8 on the 2nd day and reproduction stopped on 7th day. In a single generation, the intrinsic rate of increase per female per day was 0.225 (Fig.1), and population multiplied 66.71 times in mean generation time 'T' of 18.66 days.

$$T_c = \frac{l_x m_x X}{l_x m_x} = \frac{1245.11}{66.71} = 18.66$$

Where T_c is arbitrary 'T'

$$r_c = \frac{\text{Log}_e R_o}{T_c} = \frac{\text{Log}_e 66.71}{18.66} = 0.225$$

Where 'R'_c is arbitrary 'r'_m'

$$T_c = 18.66, \quad r_c = 0.225$$

Now arbitrary r_m 's (r_c) are 0.21 and 0.23 and their values are 1497.5762 and 1037.275 respectively.

$$r_m = e^7 - r_m \times l_x m_x = 1$$

$$r_m = 0.225 \text{ (Fig.1)}$$

Where λ is the finite rate of natural increase.

$$T = \frac{\text{Log}_e 66.71}{0.225} = 18.66 \text{ days}$$

$$T = 18.66 \text{ days}$$

In *Agathis unicolorata* (Shenefelt) a parasitoid of *Phthorimaea operculella* (Zeller) (Chundurwar, 1977), *Cotesia flavipes* (Cameron) a larval and gregarious parasitoid of *Chilo partellus* (Swin.) (Nikam and Sathe, 1983), *C.orientalis* C. & N. and *C.diurnii* R. & N., larval parasitoids of *Exelastis atomosa* Walsingham (Sathe and Nikam, 1984; Sathe, 1986), the intrinsic rates of increase were respectively 0.144, 0.176, 0.188 and 0.158. The populations multiplied by 34.56, 30.72, 41.93 and 25.99 times in mean generation time of 24.60, 19.45, 19.87 and 20.61 days respectively. While, in the present study, the intrinsic rate of increase per female per day was 0.225 and population multiplied 66.71 times in mean generation time 'T' of 18.66 days.

In *C.orientalis* and *C.diurnii* the average periods of immature stages were 17 and 18 days respectively while, in *A.jayanagarensis* the average period of immature stages was comparatively less, 16 days. Similarly, the maximum mean progeny productions per day (mx) were 11.7 and 9.7 on 3rd day. In the present species, the maximum mean production per day (mx) was 18.8 on 2nd day.

Recently, Sathe (1991) studied the fecundity life tables and intrinsic rate of natural

increase in *Glyptapanteles malshri* Sathe and Inamdar, a parasitoid of *Plutella xylostella* (Linn.). He reported that mated female had an average of 10.4 days ovipositional period and found producing on an average 69.3 adult progeny with a sex ratio (m:f) of 1:1.365. The maximum mean progeny production per day (mx) was 9.00 on the 5th day. The innate capacity of increase was 0.179 per female per day and population multiplied 39.54 times in mean generation time of 20.54 days while, in *A.jayanagarensis*, mated female's ovipositional period averaged 6.8 days, the progeny production 119.6 individuals with sex ratio (m:f) 1:2.051 and the first adult mortality was on the 5th day. Reproduction stopped on 7th day and the innate capacity of increase was 0.225 per female per day.

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