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LIFE TABLES AND INTRINSIC RATE OF NATURAL INCREASE OF *Trichospilus pupivora* POPULATION ON DIFFERENT HOSTS

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ABSTRACT

The present study deals with life tables and intrinsic rates of natural increase of *Trichospilus pupivora* Ferr. a pupal parasitoid of *Opisina arenosella* walker. The maximum mean progeny production per day was on *Ergolis merione* Cr., (86.20). The innate capacity increase ranged from 0.288 to 0.308 per female per day depending on the hosts used. The maximum multiplication of the population also occurred on the same host. The population multiplied 118.31 times in mean generation time of 15.55 days.

KEY WORDS : Life table, Pupal Parasitoid, *Trichospilus pupivora*

Trichospilus pupivora Ferr (Hymonspter: Eulsphidae) is a pupal parasitoid of *Opisina arenosella* which is being widely used for biological control of the latter. Being a polyphagous parasitoid with a wide host range, it has been reported from several species of ledidopterous pests (Jayaratnam, 1941; Nirula, 1956). Mohammed *et al* (1982) have reported this parasitoid on pupae and pre-pupae of Sphecidae and Vespidae besides lepidopteran pests. One of the peculiar traits noticed in *T. pupivora* is its reluctance to parasitise old and decaying pupae. With a view to assess the effectiveness of this parasitoid on some of its host species in terms of its intrinsic rates of natural increase, life tables were constructed.

MATERIALS AND METHODS

The cultures of the parasitoid and its hosts *viz.*, *Spodoptera litura* Fabr., *Helicoverpa armigera* Hub., *Erogolis merione* Cr. and *Opisina arensella* Walker, were maintained at laboratory conditions (22 ± 1^0 C, 50-55 % R.H.). Ten newly emerged adult females which had already been fertilised prior to emergence were offered fresh pupae of the different hosts in individual specimen tubes daily until the female died. Only one pupa was offered to each female per day as *T. pupivora* accepted only one pupa per day (Mohamed *et al.*, 1982). The parasitised pupae were incubated separately for emergence of adults. The fecundity was calculated by counting the emerged adults (Nikam and Sathe, 1983). The life tables were prepared with the help of fecundity and later the intrinsic rates of natural increase of population of *T.pupivora* were calculated using Birch's (1948) formula as elaborated by Howe (1953) and Watson (1964):

$$e^{-r}m^{x} 1x^{m}x = 1$$

Where 'e' is the base of the natural logarithms, 'x' the age of individuals in days, 1 x the number of individuals alive at age 'x' as a proportion of one and mx, the number of female offsprings produced per female in the age interval 'x'. The sum of the products 1xmx is the net reproductive rate Ro, the rate of multiplication of the population for each generation measured in terms of females produced per generation.

The approximate value of the cohort generation was calculated as follows:

$$Tc = \frac{1 x m x X}{1 x m x}$$

The arbitrary value of innate capacity for rc was calculated from the formula:

$$rc = \frac{\text{Log e Ro}}{T c}$$

This was an arbitrary value for rm and the value for rm upto two decimal places was substituted in the formula until the two values for the equation were found which lies immediately above or below 1096.6. The precise generation time 'T' was then calculated from the formula:

$$T = \frac{\text{Log e Ro}}{r m}$$

and the finite rate of increase (λ) was determined as $\lambda = e^{r}m$.

Table 1. Life table studies of *T.pupivora* on different hosts

Host	Pivotal age (X)	lx	mx	lxmx	lxmxX
		1 to 17 days immature stage			
S. litura	18.00	1.00	60.60	60.60	1090.80
	19.00	1.00	20.50	20.50	389.80
	20.00	1.00	8.50	8.50	170.00
	21.00	0.90	4.30	3.87	81.27
	22.00	0.70	0.70	0.49	10.78
	23.00	0.50	0.20	0.10	2.30
	24.00	0.20	0.10	0.02	0.48
				Ro=94.08	1745.13
H. armigera	17.00	1.00	56.60	56.60	962.20
	18.00	1.00	18.80	18.80	338.40
	19.00	1.00	7.30	7.30	138.70
	20.00	0.70	3.20	2.24	44.80
	21.00	0.50	0.60	0.30	6.30
	22.00	0.30	0.20	0.06	1.32
	23.00	0.10	0.10	0.01	0.23
				Ro = 85.31	1491.95
E. merione	18.00	1.00	86.20	86.20	1551.60
	19.00	1.00	22.10	22.10	419.90
	20.00	1.00	6.70	6.70	134.00
	21.00	1.00	2.90	2.90	60.90
	22.00	0.60	0.50	0.30	6.60
	23.00	0.50	0.20	0.10	6.90
	24.00	0.10	0.10	0.01	7.20
				Ro = 118.31	2175.54
O. arenosella	18.00	1.00	58.60	58.60	1054.80
	19.00	1.00	20.20	20.20	383.80
	20.00	0.80	5.80	4.64	92.80
	21.00	0.70	2.10	1.47	30.87
	22.00	0.50	0.70	0.35	7.70
	23.00	0.10	0.30	0.03	0.69
	24.00	0.10	0.10	0.01	0.24
				Ro = 85.30	1570.90

	S. litura	*H. armigera*	*E. merione*	*O. arenosella*
Innate capacity for increase	rc = 0.24	0.25	0.26	0.24
	rm = 0.288	0.308	0.307	0.306
Mean generation time	Tc = 18.55	17.49	18.39	18.42
	T = 15.75	14.42	15.55	14.49
Finite rate of increase	λ = 1.33	1.36	1.36	1.36

RESULTS AND DISCUSSION

It could be seen (Table 1) that the first adult mortality occurred between the three and five days after oviposition. The length of time spent in the immature period varied from 17 to 18 days. The maximum mean progeny production per day was on the first day irrespective of the host species used and there was a progressive and sharp drop in the fecundity thereafter. A similar trend was also noticed in the case of *Cotesia flavipes* (Cam.) by Nikam and Sathe (1983). However, on *E.merione* it was the maximum (86.20) and the minimum on *H.armigera* (56.60). Chundurwar (1975, 1977), Basarkar and Nikam (1981) and Nikam and Sathe (1983) attempted intrinsic rates of natural increase of *Eriborus trochanteratus* Morley. *Agathis unicolorata* Shen. *Xanthopimpla stemmator*

Thun.) and *C. flavipes* respectively. The intrinsic rates of increase were 0.166, 0.144, 0.131 and 0.176, while the population multiplied to 30.56 times in 19.10 days, 34.56 times in 24.60 days, 43.43 times in 28.78 days and 30.72 times in 19.46 days respectively in these parasitoids. In *T.pupivora* the intrinsic rates of increase varied from 0.288 to 0.308 depending on the various hosts used. The population multiplied to 118.31 times in a mean generation time of 15.55 days on *E.merione*

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RESOURCE USE EFFICIENCY IN RICE

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ABSTRACT

Resource use efficiency in rice was studied in Thanjavur district. Totally 90 respondents were interviewed personally for this study for three dominant varieties. It revealed that human labour contribution to rice yield and dummies used for regions like new and old delts was significant. Farmers were using higher seed rate. New delta performs better than old and coastal regions.

KEY WORDS : Rice, Resource, Use, Efficiency

India has to achieve a food grain production of 240 million t by 2000 AD to provide food security to about one billion people. The challenge is how to achieve this target in a short period from the existing net area sown of 145 million ha and with irrigation potential of 113 million ha. To meet the increased food demand and to enhance rice yields, we need to achieve a 5 per cent or higher growth rate in food production. We could meet this demand even from presently irrigated areas alone, because there still remains vast untapped yield potential.

With the advent of seed-fertilizer-water technologies, there has been substantial increase in rice productivity. However, when compared to some of the rice producing countries, the performance at India with regard to production per unit of land is far below its potential.

The major reason for low average yield which causes the yield gap in India is inter-and intra-regional variation in the yield of rice per ha. For example the average rice yield per hectare is 1.12 tones in Bihar. 2.34 tones in West Bengal. 3.2 tones in punjab and 4.19 tones in Haryana (WRS, 1987) Variation in productivity has pulled down the average, indicating greater opportunities to raise the rice production in states with poor performance.