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Life Tables And Intrinsic Rate of Increase in Mango Leaf Webber Orthaga Euadrusalis Walker (Pyralidae : Lepidoptera)

KEYWORDS: Orthaga euadrusalis , mango pest, life tables, intrinsic rate

T. V. Sathe

Department of Zoology, Shivaji University, Kolhapur 416 004, India.

ABSTRACT *Orthaga euadrusalis Walker (Lepidoptera : Pyralidae) is leaf webber of mango Margifera indica. It is most active from August to December. However, it found on the crop throughout the year and completes many overlapping generations. Duration of immature stages under laboratory conditions (24±1oC, 70-75% RH & 12 hr photoperiod) was 46 days. Its longevity and oviposition days averaged 4.21 and 3.60 days respectively. Intrinsic rate of increase was 0.09, maximum progeny production 'mx' (30.6) was on 2nd day, first mortality in female was observed on 4th day. Its population multiply 69.6 times in mean generation time 'T' of 47.14 days.*

INTRODUCTION

The control of insect pests of economic importance is the most pressing problem of recent years and for this the essential objects are to make the estimates of the rate of growth of the pests (Howe, 1953). The inherent characteristics of the animals are collectively called the "innate capacity for increase". Thompson (1924) for the first time developed mathematical model for population dynamics of insects. Later, Lotka (1925) investigated a function for "the intrinsic rate of natural increase, r_m". However, Birch (1948) applied this function for the first time to insects.

Mango leaf webber *Orthaga euadrusalis* Walker (Lepidoptera : Pyralidae) is potential pest of mango *Mangifera indica* (Verma & Singh, 2010). It is most active from August to December in Kolhapur region on Hapus, Ratnagiri and some hybrid varieties of mango. Review of literature indicates that Morris & Millar (1954), Stark (1959), Le Roux *et al.* (1963), Bains & Shukla (1976), Bilapate & Pawar (1980), Reddy & Bhattacharya (1988) etc. worked on life tables and intrinsic rate of increase in lepidopteran pests.

MATERIALS AND METHODS

Life tables for *O. euadrusalis* (Fig. 1) were constructed as per the method given by Birch (1948) and elaborated by Watson (1964). Initial culture of *O. euadrusalis* was maintained in the laboratory by collecting the caterpillars from the field. Newly emerged adults were caged separately in plastic containers and confined in the pair (1 male and 1 female) into the glass cage (25 x 25 x 25 cm in length, width and height) for mating. Mated females were used for calculating fecundity and constructing life tables. Observations were also made on immature stages, longevity, oviposition days and sex ratio of the species. The leaf weebers were reared at laboratory conditions (24±1°C, 70-75% RH & 12 hr photoperiod) by providing mango leaves. The life tables were prepared with the help of fecundity data and later intrinsic rate of increase was calculated.

RESULTS

The results are recorded in tables 1 to 3 and figure 1. Longevity of ovipositing females ranged from 4 to 5 days (average 4.21). The number of progeny production ranged from 112 to 147 with an average of 134.7 individuals. The male : female offsprings averaged 1 : 1.07. The average period of immature stages was 46 days. The first adult mortality was noted on the 4th day and maximum mean progeny production per day, 'm_x' was 30.6 on 2nd day. The intrinsic rate of increase was found to be 0.09 (fig. 2) per female per day and population multiplied 69.6 times in generation time 'T' of 47.14 days.

$$Tc = \frac{l_x m_x X}{l_x m_x} = \frac{3369.9}{69.6} = 48.41$$

Where 'Tc' is arbitrary 'T'

$$r_c = \frac{\log_e Ro}{Tc} = \frac{\log_e 69.6}{48.41} = 0.087$$

$r_c = 0.087$

Where 'r_c' is arbitrary 'r_m'

Now arbitrary rms are 0.067 and 0.107

$r_m = 0.09$ (by graph)

$$Tc = \frac{\log_e 69.6}{0.09} = 47.14 = T = 47.14$$

DISCUSSION

At global scenario, life table statistics and intrinsic rates of increase have been studied by sizable workers in lepidopterious insect pests. The contribution of Morris and Miller (1954) on *Choristoneura fumiferana,* Stark (1959) on *Recurva starki* and LeRoux *et al.* (1963) on *Spilonota ocellana* are prominently figured in the review of literature.

From India, Bains & Shukla (1976) studied the life tables and intrinsic rate of increase in *Chilo partellus* (Swin.) wherein the intrinsic rate of increase (rm) were in assending order at different temperatures. They reported 30°C temperature as optimum for multiplication of this pest species. Their further observations on the finite rate of increase per week were 4.67, 15.59, 21, 3.177 and 1.002 at 25°C, 30°C, 32.5°C and 35°C respectively.

In *Helicoverpa (Heliothis) armigera* (Hubn.) the value of Ro indicated that 285.06 females were produced per female during one generation. The innate capacity and finite rate for increase in numbers were 0.1210 and 1.1260 respectively. The mean duration of a generation was 46.71 days. Under conditions of abundant space, the daily finite rate of increase of *H. armigera* was 1.1286 which enabled the insect to multiply 2.3322 times every week (Bilapate & Pawar, 1980).

Reddy & Bhatacharya (1988) studied the age specific survival /mortality life table and age specific survival and fertility life table of *H. armigera* on four semisynthetic diets. Various parameters of these diets revealed that soaked form

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of soyabean based diet was highly suitable for the population growth of *H. armigera*. Similarly, maize based diet was also suitable for rearing of this insect. On this diet majority of the life parameters also showed beneficial effects. However, pea or pearl millet based diet did not helped in attaining the higher annual rate of increase as compared to maize and soyabean based diets. In present form *O. euadrusalis* the intrinsic rate of increase was 0.09 and the pest is reared on its natural food, mango leaves. It seems that intrinsic rate of increase of *O. euadrusalis* was quite low as compared to *H. armigera*. However, for laboratory rearing of *O. euadrusalis* artificial diet is yet to be investigated.

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Table - 1 : Longevity, oviposition days, fecundity and six ratio in *O. euadrusalis*.

Female No.	Adult longevity (days)	Ovi position (days)	Progeny production			Sex ratio male : female
			Male	Female	Total	
A	4.00	3.00	57	55	112	1:0.96
B	5.00	4.00	71	75	146	1:1.05
C	5.00	4.00	70	74	144	1:1.05
D	4.50	3.00	65	67	132	1:1.03
E	5.00	4.00	63	75	138	1:1.19
F	5.00	4.00	68	80	148	1:1.17
G	4.50	3.00	62	63	125	1:1.01
H	5.00	4.00	70	72	142	1:1.02
I	5.00	4.00	68	78	146	1:1.14
J	4.00	3.00	57	57	114	1:1.00
Ave.	4.21	3.60	65.1	69.6	134.7	1:1.07

Table - 2 : Daily production of females of *O. euadrusalis*.

Female No.	Progeny production					Sex ratio male : female
	Days					
	1	2	3	4	5	
A	12	37	06	D	-	55
B	9	32	22	11	D	74
C	4	30	25	8	D	67
D	13	30	22	10	D	75
E	12	36	18	12	D	78
F	8	34	28	5	D	75
G	8	36	24	12	D	80
H	7	20	26	10	D	63
I	11	33	22	6	D	72
J	3	18	27	9	D	57
Ave.	87	30.6	22.0	8.3	0	69.6

Table - 3 : Daily production of females of *O. euadrusalis*.

Pivotal age (days) x	Proportional live at age lx	No. of female progeny / female mx	$l_x m_x$	$l_x m_x X$
Immature stages 46 days				
47	1	8.70	8.70	408.90
48	1	30.60	30.60	1468.80
49	1	22.00	22.00	1078.00
50	1	8.30	8.30	415.00
51	0.9	0.00	0.00	0.00
			69.6	3369.9

Fig- 1: O. euadrusalis larvae

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