Life Tables for the Gram pod borer, *Heliothis armigera* Hubner on pea

G. G. BILAPTA[1] and V. M. PAWAR

Studies on the innate capacity for increase in numbers of *H. armigera* were carried out at 26 $\pm$ 1°C temperature on pea pods. The net reproductive rate (Ro) representing the total female births was 407.39. The population increased with a infinitesimal rate (rm) of 0.1346 and finite rate (λ) 1.14 per female per day. A generation was completed in 44.64 days. The population on reaching a stable age distribution comprised approximately 99 per cent immature stages.

H. armigera is one of the polyphagous and destructive pest of many important crops of Marathwada reogin. The objective of the present study was to collect appropriate information for the construction of the life tables under laboratory condition, when the larvae were reared on pea pods.

MATERIALS AND METHODS

A laboratory culture of *H.armigera* was used for this study. Known number of adult pairs were released for egg-laying in cages. Eggs laid on white muslin cloths were collected by wet camel hair brush and such 100 eggs were kept for hatching. Immediately after hatching, the tiny larvae were transferred on pea pods kept in the plastic containers (5 x 5cm). Pea pods were renewed daily in the morning till pupation. The adults emerged on a particular day were paired and released in separate cages for egg-laying. The average fecundity of the females on subsequent days were noted daily till all the females died. The number of eggs laid per female were divided by two (sex-ratio 1 : 1) to get the number of female births (mx). Observations from hatching of eggs till the emergence of adults were recorded daily which provided the values for the life table (lx). Life tables were constructed to the method of Birch (1948), Howe (1953) and Atwal and Bains (1974). The intrinsic rate of increase (rm), net reproductive rate (Ro) and mean generation time (T), were the basic parameters used to assess the population growth at a constant temperature of 26±1°C. Stable age-distribution (per cent distribution of various stages) was also worked out by calculating the population schedule of birth-rate and death-rate (mx and lx) when grown in a limited space.

1-2 : Department of Entomology,
   Marathwada Agricultural University, Parphani, Maharastra State.

RESULTS AND DISCUSSION

The results in Table I indicated that the pre-oviposition period ranged from 38th to 41st day of pivotal age. The survival of the immature stages (lx) from egg to adult was 0.76. The first female mortality was observed on 9th day (lx = 114.65) in the life cycle on 46th day of pivotal age. The net reproductive rate (Ro) representing the total female-births was 407.39. It was found that the

population of *H. armigera* would be able to multiply 407.39 times on lima bean at the end of each generation. The mean duration of a generation (T) was 44.64 days. The innate capacity for increase in numbers (rm) was 0.1346, and with a daily finite rate of increase (λ) 1.14, the population would multiply 2.56 times every week (Table II). In the present experiment, the contribution made by different developmental stages towards

TABLE I. Life table (for females), age specific fecundity for H. *armigera* Hbn. on pea.

x	lx	mx	lxmx	xlxmx
0-37	0.76	—	—	Immature stages
38	0.76	—	0.76	28.88
39	0.76	—	0.76	29.64
40	0.76	—	0.76	30.40
41	0.76	—	0.76	31.16
42	0.76	18.36	13.95	585.90
43	0.76	50.78	38.59	1659.37
44	0.76	106.71	81.09	3567.96
45	0.76	112.46	85.46	3845.70
46	0.73	114.65	83.69	3849.74
47	0.63	82.63	52.05	2446.35
48	0.49	61.18	29.97	1436.56
49	0.34	57.50	19.55	957.95
50	0.30	00.00	00.00	00.00

lxmx = 407.309   xlxmx = 18471.61

Net reproductive rate (Ro) = 407.39

TABLE II. Mean length of generation, innate capacity for increase in numbers and finite rate of increase in numbers in *H. armigera* Hbn.

Particulars	
Mean length of a generation	
$Tc = \dfrac{xlxmx}{Ro} =$	45.34 Days
Innate capacity for increase in numbers	
$rm = \dfrac{\log e\ Ro}{Tc}$	0.1325
Arbitrary rm (rc) 0.13, 0.14 and 0.15	
$e^7 - rmxlxmx = 1096.6$	0.1346
$T = \dfrac{\log e\ Ro}{rm}$	44.64 Days
Finite rate of increase in numbers	1.14
$=$ anti log e rm	
Weekly multiplication	2.56

TABLE III. Stable age distribution of *H. armigera* Hbn. when rm=0.1346.

x	Lx	e — rm(x - 1)	Lx.e—rm(x - 1)	Percent distribution	
1	2	3	4	5	
0	1.00	0.8740	0.8740	12.9700	
1	1.00	0.7639	0.7639	11.3361	
2	1.00	0.6677	0.6677	9.9085	50.44
3	1.00	0.5836	0.5836	8.6605	
4	1.00	0.5101	0.5101	7.5658	
5	1.00	0.4459	0.4459	6.6171	
6	1.00	0.3897	0.3897	5.7831	
7	1.00	0.3406	0.3406	5.0544	
8	1.00	0.2977	0.2977	4.4178	
9	0.98	0.2602	0.2550	3.7841	
10	0.97	0.2275	0.2206	3.2736	
11	0.96	0.1988	0.1908	2.8314	
12	0.94	0.1738	0.1633	2.4233	
13	0.92	0.1519	0.1397	2.0731	45.86

(1)	(2)	(3)	(4)	(5)	
14	0.91	0.1327	0.1208	1.7926	
15	0.89	0.1160	0.1032	1.5314	
16	0.87	0.1014	0.0882	1.3088	
17	0.86	0.0886	0.0762	1.1307	
18	0.86	0.0775	0.0666	0.9883	
19	0.86	0.0677	0.0582	0.8636	
20	0.86	0.0592	0.0509	0.7553	
21	0.86	0.0517	0.0445	0.6603	
22	0.86	0.0452	0.0389	0.5772	
23	0.86	0.0395	0.0340	0.5045	
24	0.86	0.0345	0.0297	0.4407	
25	0.86	0.0302	0.0259	0.3843	
26	0.86	0.0264	0.0227	0.3368	
27	0.86	0.0230	0.0196	0.2938	
28	0.85	0.0201	0.0171	0.2537	3.33
29	0.82	0.0176	0.0144	0.2136	
30	0.79	0.0154	0.0121	0.1795	
31	0.77	0.0134	0.0103	0.1528	
32	0.76	0.0117	0.0089	0.1320	
33	0.76	0.0102	0.0078	0.1157	
34	0.76	0.0089	0.0068	0.10S9	
35	0.76	0.0078	0.0059	0.0875	
36	0.76	0.0068	0.0054	0.0771	
37	0.76	0.0060	0.0045	0.0667	
38	0.76	0.0052	0.0036	0.0578	
39	0.76	0.0045	0.0034	0.0504	
40	0.76	0.0040	0.0030	0.0445	
41	0.76	0.0035	00.026	0.0385	
42	0.76	0.0030	0.0023	0.0341	
43	0.76	0.0026	0.0020	0.0296	
44	0.76	0.0023	0.0017	0.0252	0.34
45	0.74	0.0020	0.0015	0.0222	
46	0.67	0.0017	0.0011	0.0163	
47	0.56	0.0015	0.0008	0.0118	
48	0.41	0.0013	0.0005	0.0074	
49	0.32	0.0011	0.0003	0.0044	
50	0.30	0.0010	0.0003	0.0044	

the stable age-distribution was also
determined. It could be seen from
the Table III, that on reaching stable
age distribution, the population of
H. armigera in its various stages viz.,
egg, larva, pupa and adult contributed
to the tune of 50.44, 45.86, 3.33
and 0.34 per cent respectively.

REFERENCES

ATWAL, A.S. and S.S. BAINS. 1974. Applie:
animal ecology. Kalyani Publishers, Ludhi
ana, pp 245.

BIRCH, L.C. 1948. The intrinsic rate of natu
tal increase in an insect population. *J. anim*
Ecol. 17 : 15-26.

HOWE, R.W. 1953. The rapid determinatio:
of intrinsic rate of increase of an insec
population. *Ann. appl. Biol.* 40 : 134-55