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Life-table and Innate Capacity of Increase of *Heliothis armigera* Hubner (Lepidoptera : Noctuidae) on Tobacco

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Heliothis armigera Hubner is typically a polyphagous pest infesting many cultivated crops. Bhatnagar and Davies (1978) recorded 50 species of crop plants and 48 species of wild and weed species of plants for this pest. Life-table can be used to make quantitative and qualitative evaluation of different host plants. A type of life-table developed by Birch (1948) can be used for both qualitative evaluation of the hosts and to estimate the potential increase of insects reared on different commodities. Many authors have described the importance of the ability of a population to increase. Because of the importance of reproductive ability or biotic potential, a statistic was developed to quantify and explain the population increase. This statistic is the innate capacity of increase which is also called as the true, inherent or intrinsic rate of natural increase. The innate capactiy for increase has not been determined for many of the Phytophagous insects (Wellik and Pedigo, 1978). An attempt was, therefore, made to construct the life-table under laboratory conditions, when the larvae of *H. armigera* were reared on tobacco capsules.

A laboratory culture of *H. armigera* was used for this study. Known number of adult pairs were released for egg laying in wooden cages (30 cmx30 cm x 45 cm). Freshly laid eggs were collected with the help of a wet camel hair brush and such 100 eggs were kept for hatching. Immediately after hatching, the tiny larvae were transferred on tobacco capsules (*Nicotiana tabacum*) kept in plastic container (5 x 5 cm). The tobacco capsules were changed daily in the morning till all larvae pupated. The adults emerged on a particular day were paired and released in separate cages for egg laying. The fecundity of females on subsequent days was noted daily till all the females died. The number of eggs laid per female was divided by 2 (sex-ratio 1:1) to get the number of female births (mx). Observations on mortality during different stages 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 according to the method of Birch (1948), Howe (1953) and Atwal and Bains (1974). The innate capacity 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 life stages) was also worked out by calculating the population schedule of birth-rate (mx) and death-rate, when reared in a limited space.

The life-table showing the survival (lx) and age-specific fecundity of *H. armigera* is presented in Table-1. The pre-oviposition period ranged from 33rd to

36th day of pivotal age. The first female mortality occurred on 43 rd day (lx=0.48) of pivotal age. The highest mx' was 130.60 females per female on 41st day of pivotal age. The net reproductive rate (Ro) representing the total fermale briths was 320.49 females.

The innate capacity for increase in numbers (rm) was 0.1416 female per female per day with a daily finite rate of increase (y) 1.1520 females per female per day. The length of developmental and reproductive stage was found to be 41.02 days for this cohort. The hypothetical F_2 females were 1,02,713,84 (Table 2). The stable-age distribution of *H. armigera* was computed, when reared under given set of conditions. It was found that the contribution made in adult stage was only 0.68 per cent of pupulation of stable-age. The contribution of other stages viz; egg, larva and pupa was 45.09, 52.46 and 1.18 percent respectively. Similar studies on different hosts were carried otn by Dhandapani and Balsubramanian (1979) on cotton, Bill apate and Pawar (1978) on pea, Bilapate *et al.* (1981) on chickpea and Bilapate *et al.* (1977) on green lima bean and lucerne. The results on innate capacity for increase in numbers (rm) reported by them are more or less similar to present investigation. Slight variations in different parameters were due to the variation in hosts.

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TABLE 1

Life-table (for females) and age specific fecundity for *H. armigera* **on tobacco.**

Pivolal age in days (*x*)	*Survival of female at different age interval* (*lx*)	*Age schedule for female birth* (*mx*)	*lxmx*	*xlxmx*
0-32	—	—	—	Immature
33	0.60	—	0.60	19.60
34	0.60	—	0.60	20.40
35	0.60	—	0.60	21.00
36	0.60	—	0.60	21.60
37	0.60	7.22	4.33	160.33
38	0.60	14.76	8.86	336.68
39	0.60	49.12	47.47	1851.19
40	0.60	93.43	46.86	2242.66
41	0.60	130.60	78.36	3243.08
42	0.60	100.86	60.52	2541.70
43	0.48	79.40	38.11	1638.78
44	0.38	47.71	18.13	787.50
45	0.32	19.83	6.25	281.25
46	0.30	—	—	—

Net reproductive rate (R0)

Σ lxm = 320.49

Σ xlxmx = 13145.94

TABLE 2

Mean length of generation, innate capacity for increase in numbers and finite rate of increase in numbers of *H. armigera* on tobacco.

Sr. No.	*Population growth statistics*	*Formula*	*Calculated values*
1.	Mean length of generation	$TC = \frac{\sum xlxm\ x}{R0}$	41.02 days
2.	Innate capacity for increase	$rm = \frac{\log e^{RO}}{TC}$	0.1406 females/ female/day
3.	Arbitrary 'rm' (rc)	0.14 and 0.15	
4.	Corrected 'rm'	$\sum e^{7}\text{-rmx} \cdot lxmx$	0.1416 females/ female/day
5.	Corrected generation time	$T = \frac{\log eRO}{rm}$	40.75 day
6.	Finite rate of increase in numbers	$\lambda = \text{antilog } e^{rm}$	1.1520 females/ female/day
7.	Weekly multiplication of population	$(\lambda)^7$	2.701 times
8.	Hypothetical F_2 females	$(R_0)^2$	102713.84

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