Proc. Indian Acad. Sci. (Anim. Sci.), Vol. 93, No. 1, January 1984, pp. 29–33.


# Life fecundity tables of *Spodoptera litura* (Fabricius) on different hosts

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MS received 7 January 1983

**Abstract.** Life fecundity tables were studied for *Spodoptera litura* (Fabricius) when reared on castor (*Ricinus communis* L.), groundnut (*Arachis hypogea*), okra (*Abelmoschus esculentus* L.) and sunflower (*Helianthus annuus* L.) under laboratory conditions at 26·8 ± 2°C temperature. The net reproductive rate ($R_0$), was calculated in each case.

**Keywords.** Life fecundity; *Spodoptera litura*; castor; groundnut; sunflower.

## 1. Introduction

The tobacco caterpillar, *Spodoptera litura* (Fab.) is a serious polyphagus insect species attacking a wide range of food plants belonging to diverse botanical origin. It has been reported to feed on 112 cultivated food plants belonging to 44 families all over the world (Moussa *et al* 1960) of which 60 are known from India (Lefroy 1908; Basu 1943; Thobbi 1961; Bhattacharya and Rathore 1977). The food plants play a vital role in development, survival and reproductive potential of insect (Painter 1951). Food may influence the chances of insect to survive and multiply by modifying its growth, fecundity and longevity. In the present paper we report the intrinsic rates of natural increase ($r_m$) of *S. litura* when reared on different hosts.

## 2. Material and methods

The culture of *Spodoptera litura* (Fabricius) was reared from gravid females collected at light trap in August 1980. The females were released into plastic containers (12 cm diameter × 15 cm height) covered with muslin cloth held in position by rubber band. To construct the life fecundity tables, 100 eggs were placed in ten plastic boxes in batches of 10 each. After hatching, all the larvae were reared individually on castor (*Ricinus communis* L.), groundnut (*Arachis hypogea*), okra (*Abelmoschus esculentus* L.) and sunflower (*Helianthus annuus* L.). Fresh food was supplied daily. The hatching, larval and pupal development, successful adult emergence, fecundity and age specific mortality in eggs, larvae, pupae and adults were observed everyday. To determine the age-specific fecundity, the total number of adults emerged on a particular day was transferred to a separate plastic jar (12 × 15 cm). A paper strip (7·5 × 5 cm) folded in zig-zag fashion was provided as oviposition site. The column headings proposed by Birch (1948), elaborated by Atwal and Bains (1974) were used to construct life fecundity tables under laboratory conditions 26·8 ± 2°C temperature.

## 3. Results and discussion

The data regarding the survival of different stages of *S. litura* on different hosts are presented in table 1. The survival of immature stages on castor, groundnut, okra and sunflower is 52, 44, 82 and 73 respectively. The results on the life table and age-specific fecundity are summarised in table 2. The net reproductive rate ($R_0$ of *S. litura* was 873·13 on castor, 741·70 on groundnut, 1561·99 on okra and 1467·93 females per female per generation on sunflower. The results obtained on mean generation time and innate capacity for increase in numbers are depicted in table 3. The mean length of generation ($T$) differed considerably on different hosts. It was maximum (45·83 days) on groundnut and minimum (35·19 days) on sunflower. The innate capacity for increase in numbers ($r_m$) ranged between 0·1442 and 0·2072 female per female per day. Based on $r_m$ values the descending order of food plants was: sunflower (0·2072), castor (0·1900), okra (0·1843) and groundnut (0·1442). There was not much variation in the finite rate of increase in numbers ($\lambda$), weekly multiplication of population and doubling time when reared on different hosts.

According to Birch (1948), the comparison of two or more populations by means of their reproductive rates may be quite misleading unless the mean length of generations is the same. Two or more populations may have the same reproductive rate but their intrinsic rates of increase may be quite different because of different length of generations. Indeed, it is evident that on the basis of the net reproductive rate ($R_0$) okra occupied first position, however, it ranked third on the basis of innate capacity of increase in numbers ($r_m$). This shift in the position of okra is thus attributable to a relatively higher value of generation time which reduced the value of $r_m$. Life-tables giving the statistics on the innate capacity of increase in numbers of a particular species provide insight into the characterjstic life patterns of different species. In the present studies, from the point of view of pest multiplication, sunflower with high $r_m$ value would be the most suitable. *S. litura* would multiply 1561·99 times per generation on okra while the corresponding increase in groundnut and castor will be 741·70 and 873·13 times *i.e.* the population would increase 2-fold on okra and sunflower. Bilapate *et al* (1980c) studied the life fecundity tables of *S. litura* on sunflower at $26 \pm 1$°C and $30 \pm 1$°C temperature. They found that the net reproductive rates were 799·82 and 966·88 at two different temperatures. In the present investigation, the net reproductive

**Table 1.** Survival and duration of life stages of *S. litura* on different hosts.

| | | Number surviving | | | |
|---|---|---|---|---|---|
| Name of host | Egg kept | Egg period (days) | Larval period (days) | Prepupal period (days) | Pupal period (days) |
| | | 0–3 | 4–16 | 17–18 | 19–29 |
| Castor | 100 | 100 | 85 | 84 | 52 |
| | | 0–3 | 4–28 | 29–30 | 31–41 |
| Groundnut | 100 | 100 | 46 | 46 | 44 |
| | | 0–4 | 5–23 | 24–25 | 26–36 |
| Okra | 100 | 100 | 92 | 92 | 82 |
| | | 0–3 | 4–18 | 19–20 | 21–31 |
| Sunflower | 100 | 100 | 94 | 90 | 73 |

**Table 2.** Life tables (for female) and age-specific fecundity for *S. litura* on different hosts.

| Name of host | Pivotal age in days $X$ | Survival of female at different age intervals $l_x$ | Age schedule for female births $m_x$ | $l_x m_x$ | $l_x m_x X$ |
|---|---|---|---|---|---|
| Castor | 0–29 | 0·52 | | Immature stages | |
| | 30–33 | 0·52 | Preoviposition period | | |
| | 34 | 0·52 | 393·00 | 204·36 | 6948·24 |
| | 35 | 0·52 | 350·50 | 182·26 | 6379·10 |
| | 36 | 0·52 | 359·55 | 186·96 | 6730·77 |
| | 37 | 0·44 | 364·57 | 160·41 | 5935·19 |
| | 38 | 0·33 | 421·66 | 139·14 | 5287·61 |
| | 39 | 0·25 | 0·0 | 0·0 | 0·0 |
| | | | | = 873·13 $\Sigma l_x m_x$ | = 31280·91 $\Sigma l_x m_x X$ |
| Groundnut | 0–41 | 0·44 | | Immature stages | |
| | 42–44 | 0·44 | Preoviposition period | | |
| | 45 | 0·44 | 734·55 | 323·20 | 14544·09 |
| | 46 | 0·42 | 471·00 | 197·82 | 9099·72 |
| | 47 | 0·42 | 282·61 | 118·69 | 5578·72 |
| | 48 | 0·38 | 143·64 | 54·58 | 2619·99 |
| | 49 | 0·29 | 163·50 | 47·41 | 2323·33 |
| | 50 | 0·22 | 0·0 | 0·0 | 0·0 |
| | | | | = 741·70 $\Sigma l_x m_x$ | = 34165·85 $\Sigma l_x m_x X$ |
| Okra | 0–36 | 0·82 | | Immature stages | |
| | 37–38 | 0·82 | Preoviposition period | | |
| | 39 | 0·82 | 712·70 | 584·41 | 22791·99 |
| | 40 | 0·82 | 622·95 | 510·49 | 20419·64 |
| | 41 | 0·78 | 403·11 | 314·42 | 12891·45 |
| | 42 | 0·78 | 156·72 | 122·24 | 5134·14 |
| | 43 | 0·66 | 46·16 | 30·43 | 1308·60 |
| | 44 | 0·42 | 0·0 | 0·0 | 0·0 |
| | | | | = 1561·99 $\Sigma l_x m_x$ | = 62545·82 $\Sigma l_x m_x X$ |
| Sunflower | 0–31 | 0·73 | | Immature stages | |
| | 32–33 | 0·73 | Preoviposition period | | |
| | 34 | 0·73 | 569·30 | 415·58 | 14130·02 |
| | 35 | 0·73 | 675·05 | 492·78 | 17247·52 |
| | 36 | 0·69 | 439·94 | 303·55 | 10928·10 |
| | 37 | 0·55 | 272·10 | 149·65 | 5537·35 |
| | 38 | 0·44 | 241·75 | 106·37 | 4042·06 |
| | 39 | 0·37 | 0·0 | 0·0 | 0·0 |
| | | | | = 1467·93 $\Sigma l_x m_x$ | = 51885·05 $\Sigma l_x m_x X$ |

**Table 3.** Mean length of generation ($T$), intrinsic rate of natural increase ($r_m$) and finite rate of increase in numbers ($\lambda$) of *S. litura* on different hosts.

| Name of host | Mean length of a generation $T_c = \frac{\Sigma l_x m_x X}{R_o}$ | Innate capacity for increase in numbers $r_c = \frac{\log_e R_o}{T_c}$ | Corrected $r_m$ $\Sigma e^{7-r} m^x l_x m_x$ = 1096·6 (female/female/day) | Corrected generation time $T = \frac{\log_e R_o}{r_m}$ | Finite rate of increase in numbers $\lambda$ = anti $\log_e r_m$ | Weekly multiplication | Doubling time | Hypothetical $F_2$ females |
|---|---|---|---|---|---|---|---|---|
| Castor | 35·43 | 0·1890 | 0·1900 | 35·64 | 1·21 | 3·80 | 3·65 | 7 62 355 |
| Groundnut | 46·06 | 0·1435 | 0·1442 | 45·83 | 1·15 | 2·66 | 4·81 | 5 50 118 |
| Okra | 40·04 | 0.1837 | 0·1843 | 39·90 | 1·20 | 3·58 | 3·76 | 24 39 812 |
| Sunflower | 35·34 | 0·2063 | 0·2072 | 35·19 | 1·23 | 4·26 | 3·34 | 21 54 818 |

rate was higher than those observed by Bilapate *et al* (1980c). Tamaki *et al* (1972) developed life tables for evaluating the rearing of *Ceramica picta*. They observed that the insects reared as larvae on sugarbeet leaves in trays had a multiplication rate of 422 females per female per generation and the rate of reproduction was 9- and 16-fold greater than the rates of those from larvae reared on artificial diets in cups or trays. In literature, life fecundity studies have also been reported for *Heliothis armigera* (Hubner) when reared on different hosts (Bilapate and Pawar 1978; Bilapate and Pawar 1980; Bilapate *et al* 1977, 1978, 1980a, b; 1981).

**Acknowledgement**

The authors thank Prof. P R Chopde, College of Agriculture, Parbhani (M S) for facilities

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