Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(4): 613-615

Received: 28-05-2019
Accepted: 30-06-2019

**Anuj Kumar Mishra**
Department of Entomology, SVPUA&T, Modipuram, Meerut, Uttar Pradesh, India

**Hem Singh**
Department of Entomology, SVPUA&T, Modipuram, Meerut, Uttar Pradesh, India

**Suraj Kumar**
Department of Entomology, NDUA&T, Kumarganj, Ayodhya, Uttar Pradesh, India

**Arvind Singh**
Department of Entomology, SVPUA&T, Modipuram, Meerut, Uttar Pradesh, India

**Awaneesh Kumar**
Department of Entomology AAU, Jorhat, Assam, India

**Correspondence**
**Anuj Kumar Mishra**
Department of Entomology, SVPUA&T, Modipuram, Meerut, Uttar Pradesh, India

# Construction of stage specific life table of *Earias vittella* Feb. under control conditions

**Anuj Kumar Mishra, Hem Singh, Suraj Kumar, Arvind Singh and Awaneesh Kumar**

**Abstract**
Apparent mortality at early larval stage was revealed 10.00 percent to control condition (28±1°C). Highest Survival fraction 0.90 was recorded at egg stage and early instar and late instar larval was investigated 0.90 and 0.96 respectively. Pre-pupal and pupal stage survival fraction was recorded 0.96 and 0.91 at control condition (28±1°C). While, minimum 0.87 survival fraction at egg stage and early and late instar larval stage were recorded 0.839 and 0.958 percent at control condition (28±1°C). K-value is the key factor, which is primarily responsible for increase or decrease in number from one generation to another. The k-value 0.18 was observed at control condition (28±1°C).

**Keywords:** Stage specific life table, *Earias vittella* Feb., under control conditions

## Introduction
The crop is vulnerable to attacked large number of important insect pests. Among which, *Earias vittella* Fab. And *Earias insulana* Boisd, cotton whitefly, *Bemisia tabaci* Guen. leaf rolar, *Sylepta derogate* Fab. pink boll worm, *Pectinophora gossypiella* Saunder, are quite important besides these cotton aphid, *Aphis gossypii* Grover is also considered as an important pest of this crop [2]. The shoot and fruit borer is one of the most important and serious insect pests causing direct damage to marketable fresh fruits, which causes 8.4 to 73.2 percent fruits infestation depending on the season and environmental condition. The avoidable loss in yield and fruit damage due to this pest has been estimated from 36 to 90 percent [4]. There are mainly two species of shoot and fruit borer *viz. E. vittella* Fab. And *E. insulana* Fab. when the crop is only few weeks old, the freshly hatched caterpillars bore into tender shoots and tunnel downward, these shoots wither, drooped and ultimately the growing points of the plants are destroyed. On the formation of buds, flowers and fruits, the caterpillars bore inside these and feed on inner tissues. They move from bud to bud and fruit to fruit, thus causing damage to the large number of fruiting bodies. The damaged buds and flowers wither and fall down without bearing any fruit, whereas the affected fruits become deformed in shape and remain stunted in growth. Such fruits are unfit for human consumption and have hardly any market value [6].
Among these two species, *E. vittella* is a pre-dominant species in Gujarat State. Attempts were therefore, made to study the life tables of okra fruit borer for their affective management [3]. The life table studies of major insect pests, their parasitoids predators and crops can provide excellent guidelines in the planning of pest management strategies. Life table study is one of the useful numerical aids in studying the population. It may also be analyzed to determine relative contribution of immature stage of the population of pest species. Considering important role that life table providing information in the regulation of natural population in insects, it is appropriate to discuss their use in insect pest management.

## Materials and Methods
All the lab experiments were conducted in Sericulture Research, Demonstration and Training Unit Research lab, Department of Entomology, College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P.)

## Stage Specific Life Table
Data on stage specific survival for eggs, larvae, pupae and adults were recorded from the age specific survival and mortality life-table. The data obtained from each table were used for computing various life parameters as given below.

**Apparent Mortality**
This is measured mortality and gives the information on number dying as percentage of number entering that stage and was calculated by using the formula.

Apparent mortality = $l_x+1(x+1)/2$.

**Stage Specific Survival Fraction ($S_x$)**
Data obtained on apparent mortality was used for the calculation of the stage specific survival fraction ($S_x$) of each stage by using equation.

$S_x$ of particular stage = [$l_x$ of subsequent stage]/ [$l_x$ of particular stage]

**Generation Survival Fraction ($S_G$)**
This parameter was calculated by the following equation.
$S_G = S_E.S_l.$ Sp
$S_E = S_X$ of egg stage
$S_L = S_X$ of larval stage.
$S_P = S_X$ of pupal stage.

**Mortality Survival Ratio (M.S.R.)**
It is the increase in population that was occurred if the mortality in the stage, in question had not occurred and calculated as follows-

M.S.R. of particular stage = [$l_x$ mortality in particular stage] / [$l_x$ of subsequent stage]

**Indispensable Mortality (IM)**
This type of mortality would not have occurred unless the factor (S) causing it was not allowed to operate, while the subsequent mortality factors operate. The equation is;
IM= Number of adults emerged x M.S.R. of particular stage.

**K-values**
It is the key factor which is primarily represented for increase or decrease in number from one generation to another and was computed as the difference between the successive values for "log $l_x$". The total generation mortality was calculated by adding the k-values of different development stages of the insect which is designated/Indicated as "K" [5, 7]

$K = k_0 + k_1 + k_2 + k_3$

Where $k_o$, $k_1$, $k_2$ and $k_3$ are the k-values at egg, larval, pre-pupal and pupal stages, respectively.

**Results and Discussion**
Stage specific life table of *E. vittella* Feb. at 28±1 °C
The stage specific life-table was summed up from the data obtained from age specific life-tables. The parameters taken in this table comprised with apparent mortality, stage specific survival fraction, generation survival fraction, mortality survival ratio, indispensable mortality and 'K' values are as fallows-

**Apparent mortality (100qx)**
The stage specific life-table was constructed from the data obtained from age specific life table. Apparent mortality data (Table-1) revealed that eggs exhibited 10.0% mortality followed by 10.0% and 3.70% mortality were recorded at early and late instar larval stage, respectively, 3.85 % and 9.33% were recorded at pre pupal and pupal stage under control condition at temperature 28±1 °C

**Survival Fraction (Sx)**
There was pronounced variation in the values of survivor fraction (Sx) between egg and other development stages. The survivor fraction was observed on egg stage 0.90 and early instar larvae 0.90, Survival Fraction was high at late instar larvae 0.96 and pre pupal stage 0.96 followed by pupal stage in survivor fraction were recorded 0.91 respectively. The generation survival fraction SG was recorded 0.90 (0.90+0.96) 0.96×0.91 = 1.4624

**Mortality Survival Ratio (MSR)**
The data declared that the MSR was recorded at egg stage 0.11 and early stage larvae 0.11 followed by late instar larvae MSR were recorded 0.04 after that pre pupal and pupal stage were observed 0.04 and 0.10 respectively.

**Indispensable Mortality (IM)**
Egg stage of *Earias vittella* Feb. was Indispensable Mortality (IM) recorded highest 7.48 value on as egg stage. The Indispensable Mortality value was recorded at early stage and late stage larvae 7.48 and 2.72 followed by pre pupa and pupa stage of indispensable mortality were recorded 2.72 and 6.8, respectively.

**K- value**
The maximum k- value of 0.05 were observed on egg stage and early instar larvae followed by pupal stage were recorded the k- value 0.04 and the lowest 0.02 k- value was observed on late instar larvae and per pupal stage.
The stage specific life table with different development stages displayed change in generation survival of *Earias vittella* Feb. under control condition (28±1°C). While considering generation survival, it was observed that there was clear variation in the values computed. The highest survival fraction was at pre-pupal under control condition stage. The highest mortality fraction at early instars larvae stage minimum value for mortality fraction was observed on the pre pupal stage on *Earias vittella* Feb. While the total mortality of generation was indispensable mortality 10.64 at control condition (28±1°C) respectively. At egg stage, the apparent mortality was observed maximum when a comparison was made between larval instars, the highest mortality was observed at control condition 28±1°C on early instar larval stage, where minimum death was recorded at last instar larval stage. In present investigations the early larval instars were much delicate than the later instars and hence, showed higher mortality at first instar stage. Efforts have also been constructed the ecological life table so that they can be used as resources in the perusal of insect's population dynamics. Such type of tables recorded a chain of succession measurements pointing population changes throughout the life cycle of *Earias vittella* Feb. in its natural environment. This finding was found comparable with the finding of Arshad Ali and Parvez Qamar Rizvi 2010 [1], on *Coocinella septemounctata* and Wajid Hasan and M.S. Ansari, 2009 [3], on Life table of spotted bollworm, *Earias vittella* Feb. Age specific life table demonstrated that the age specific survivorship (lx) on okra fruit borer, *Earias vittella* Feb. under control condition. There was an initial tumble in survivorship followed by an intermittent steadfast declined with long pauses till the emergence of adult. At adult stage,

the sharp digressive was recorded on the *Earias vittella* Feb. at control conditions (28±1°C) conditions until each generation was expelled. Mortality was less recorded at control condition. The *Earias vittella* Feb. took shortest time (34 days) to completes its generation at control condition (28±1 °C). The life expectancy also demonstrated for the *Earias vittella* Feb. at control condition (28±1 °C). Life expectancy was initially fluctuate and then followed by an easefully drop in the values up to termination of generation. The taken from the stage specific life-table exhibited the highest apparent mortality (13.00 per cent) at early instar larval stage recorded under room temperature, while apparent mortality (10.00 per cent) was minimum recorded at early stage larvae of *Earias vittella* Feb. at control condition (28±1 °C). As for as the survival fraction was affined highest at late instar larval stage and in all the egg stage early instar larval pre-pupal and pupal stage. However, there was the little variation in the value obtained at diverse developmental stage.

**Table 1:** Stage specific life table of *Earias vittella* Feb. at control conditions

| Stage (X) | No of Surviving at each stages (Ix) | No of dyingat each stages (dx) | Apparent mortality % (100qx) | Survival Fraction (Sx) | Mortality/Survival ratio (MSR) | Indispensable mortality (IM) | Log Ix | K- value |
|---|---|---|---|---|---|---|---|---|
| Egg | 100 | 10 | 10.00 | 0.90 | 0.11 | 7.48 | 2.00 | 0.05 |
| Early Instars Larvae | 90 | 9 | 10.00 | 0.90 | 0.11 | 7.48 | 1.95 | 0.05 |
| Late Instars Larvae | 81 | 3 | 3.70 | 0.96 | 0.04 | 2.72 | 1.91 | 0.02 |
| Pre Pupa | 78 | 3 | 3.85 | 0.96 | 0.04 | 2.72 | 1.89 | 0.02 |
| Pupa | 75 | 7 | 9.33 | 0.91 | 0.10 | 6.8 | 1.88 | 0.04 |
| Adult | 68 | 68 | 100.00 | 0.00 | 0.00 | 0.00 | 1.83 | 0.00 |
| | | | | | | | | K=0.18 |

## Conclusion

The intrinsic rate of increase, finite rate of increase and also found in same manner the doubling time were recorded highest 6.167 at control condition (28±1°C), annual rate of increase was recorded 6.67214 $\times 10^{17}$ at control condition. Unless, mean length of generation was found to be 31.290 days at control temperature.

## References


1. Ali A, Rizvi PQ. Age and Stage Specific Life Table of *Coocinella septemounctata* (Coleoptera: Coccinellidae) at Varying Temperature World J of Agric. Sci. 2010; 6(3):268-273.ISSN 1817-3047.
2. Dubey VK, Bhagat KP, Kaushik UK, Yadu YK. Insect pest succession studies on okra J Appl. Zool. Res. 1999; 10(2):144-145.
3. Hasan W, Ansari MS. Life Table of Spotted Bollworm, *Earias vittella* on Okra Ann. Pl. Protec. Sci. 2009; 17(1):86-895, 175-179.
4. Mishra HP, Das DD, Mahapatra D. Efficacy of some insecticides against okra fruit borer and leaf roller. Ann. Pl. Protec. Sci. 2002; 10:51-54.
5. Southwood TRE. Ecological methods with particular reference to the study of insect populations. 2nd ed. London, 1978.
6. Srivastava KP, Butani DK. Chillis. Pest Management in vegetables. 1998, 173-191.
7. Varley GC, Gradwell GR, Hassell MP. Insect Population Ecology: an analytical approach. University of California press, 1974.