*Progressive Research 9 (Special) : 541-542 (2014)* *Society for Sci. Dev. in Agric. and Tech.*

# SPATIAL DISTRIBUTION OF BRINJAL SHOOT AND FRUIT BORER, *Leucinodes orbonalis* GUENEE ON BRINJAL

**S. Ramesh, C. Narendra Reddy and T.V.K. Singh**

*Department of Entomology, College of Agriculture, Rajendranagar,*
*Acharya N.G. Ranga Agricultural University, Hyderabad-500030. Andhra Pradesh, India.*

Brinjal shoot and fruit borer is one of the most serious pests of brinjal and widely distributed all over India, wherever this crop is grown. The infestation on brinjal crop starts after a few weeks following transplantation which results in withering of leaves, fruits and shoots. The larvae bore inside feed on internal content which can be easily recognized by the presence of entry holes plugged with its excreta. Spatial distribution of shoot and fruit borer on brinjal, which is essential for pest management recommendations, hence an attempt made to ascertain its spatial distribution.

Studies on distribution pattern of brinjal shoot and fruit borer was conducted by raising an unprotected brinjal crop during kharif, 2013-14, in an area of 16 x 13m. The entire area was divided into 50 equal quadrates. In each quadrate, two plants were tagged and observations on distribution of *L. orbonalis* larvae damage on the basis of shoot and fruit infestation per plant were recorded at weekly intervals starting from the first appearance of the pest till crop harvest. The data obtained for each set of observations were arranged in a frequency distribution with convenient class intervals of test insect against number of plants. This data was subjected to different statistical tests. The possible relation between variance ($S^2$) and mean ($\overline{X}$) parameters of negative binomial distribution i.e. mean ($\overline{X}$) and exponent (K) was calculated as per the procedure given by (1), index of mean crowding and Lloyds patchiness index (2) was worked out.

**(A) Dispersion parameter 'K'**

The first step was calculation of dispersion of parameter 'K' (movement estimate of K) for all the weekly observations by using the formula of Ellott (1979).

$$K = \frac{(\overline{X})^2}{(S)^2 - \overline{X}}$$

**(B) Variance to Mean Ratio or Index of Dispersion (Id)**

$$I_d = S^2 / \overline{X}$$

This index of dispersion will often depart from unity, a value of zero implies regular distribution and a value greater than one imply for aggregation or contagious type distribution.

**(C) Reciprocal of the exponent 'K'**

It was worked out to know the clumping behavior of individuals in the population. Calculated value of exponent K<8 and its reciprocal 1/K > 0 with positive sign indicates contagious nature of distribution.

**(D) Lioyd's Index of Mean Crowding**

The degree of crowding experienced by individual was worked out by $X^* = \overline{X} = \left(\frac{S^2}{\overline{X} - 1}\right)$

**(E) Lioyd patchiness' index**

Lioyd patchiness index was worked out by

$$\frac{X^*}{\overline{X}} = 1 + \frac{1}{K}$$

Patchiness' index describes how many times as crowded individual is on the average, as it would be if the same population had a random distribution. The values of patchiness index > 1 indicate an aggregated or clumped type distribution, patchiness = 1 random distribution and patchiness < 1, a regular distribution.

To ascertain the distribution of brinjal shoot and fruit borer infestation in space, various statistical parameters including variance ($S^2$) and mean ($\overline{X}$) are presented in Table-1.The brinjal shoot and fruit borer infestation was noticed from 30 days (41$^{st}$ week) after transplanting of the crop and the pest was found infesting till the harvest of the crop. The values of variance of shoot and fruit borer infestation were greater than corresponding mean values ($S^2 > \overline{X}$) for all the weeks of observation, which suggests the

**Table-1:** Distribution Pattern of Leucinodes orbonalis on brinjal

| Standard week | Age of the crop | Mean ($\bar{X}$) | Variance ($S^2$) | Dispersion parameter (K) | $\frac{1}{K}$ Value | Variance to mean ratio ($I_d$) | Lloyds' index of mean crowding ($X^*$) | Lloyds Patchiness index $\left(\frac{X^*}{\bar{X}}\right)$ | Pattern of distribution |
|---|---|---|---|---|---|---|---|---|---|
| **Shoot infestation** | | | | | | | | | |
| 41 | 30 | 5.120 | 14.139 | 0.854 | 1.170 | 2.762 | 6.882 | 1.344 | Clumped |
| 42 | 37 | 6.720 | 23.524 | 0.920 | 1.087 | 3.501 | 9.221 | 1.372 | Clumped |
| 43 | 44 | 6.305 | 19.565 | 1.031 | 0.969 | 3.103 | 8.408 | 1.334 | Clumped |
| 44 | 51 | 3.744 | 5.915 | 1.369 | 0.730 | 1.580 | 4.324 | 1.155 | Clumped |
| **Fruit infestation** | | | | | | | | | |
| 44 | 51 | 17.251 | 81.510 | 2.651 | 0.377 | 4.725 | 20.976 | 1.216 | Clumped |
| 45 | 58 | 22.180 | 135.691 | 2.625 | 0.381 | 6.118 | 27.298 | 1.231 | Clumped |
| 46 | 65 | 22.694 | 139.250 | 2.698 | 0.371 | 6.136 | 27.830 | 1.226 | Clumped |
| 47 | 72 | 21.340 | 126.581 | 2.597 | 0.385 | 5.932 | 26.272 | 1.231 | Clumped |
| 48 | 79 | 16.056 | 68.352 | 2.771 | 0.361 | 4.257 | 19.313 | 1.203 | Clumped |
| 49 | 86 | 18.890 | 85.652 | 3.166 | 0.316 | 4.534 | 22.424 | 1.187 | Clumped |
| 50 | 93 | 14.725 | 60.122 | 2.606 | 0.384 | 4.083 | 17.808 | 1.209 | Clumped |
| 51 | 100 | 11.254 | 58.254 | 1.174 | 0.852 | 5.176 | 15.430 | 1.371 | Clumped |
| 52 | 107 | 10.987 | 65.289 | 0.848 | 1.178 | 5.942 | 15.929 | 1.450 | Clumped |
| 53 | 114 | 7.504 | 39.485 | 0.424 | 2.355 | 5.265 | 11.765 | 1.569 | Clumped |

infestation was clumped. The values of variance to mean ratio exceeded unity in all the sampling occasions indicating a contagious type of distribution. Further, the numerical value of 'K' was less than eight in all the sampling dates, which signified that the distribution pattern was clumped in nature. The reciprocal of 'K' values were more than zero with a positive sign for all the weeks of observations indicating contagious nature of distribution of shoot and fruit borer on brinjal. The patchiness index values in all the weeks of observation were greater than one indicating that the aggregated nature distributions of shoot and fruit borer population on brinjal. The indices of mean crowding and patchiness index also confirmed these observations. The results that the distribution pattern of brinjal shoot and fruit borer was corroborated the findings of (3) on shoot and fruit borer of brinjal and (4,5,6) on diamondback moth.

## REFERENCES


1. Ellott, J.M. (1977). Some Methods for the Statistical Analysis of Benthic Invertebrates, 2nd edition., Ambleside: *Fresh water Biological Association.* pp 351.
2. Lloyd, M. (1967). Mean crowding. J*ournal of Animal Ecology, 36 :* 1-30.
3. Shukla, R.P. (1986). Spatial pattern of eggplant shoot and fruit borer, Leucinodes orbonalis Guenee (Lepidoptera: Pyraustidae) larvae. *International Journal of Tropical Insect Science. 7(5) :* 611-615.
4. Chen, C and Wen-ying Su. (1986). Spatial pattern and transformation of field counts of *Plutella Xylostella* (L.) larvae on Cauliflower. *Plant Protection Bulletin. 28 :* 323-333.
5. Reddy, C.N.; Singh, T.V.K.; Reddy, D.D.R. and Goud, R. (1996). Distribution pattern of diamondback moth Plutella xylostella on cabbage at Hyderabad. *Indian Journal of Entomology. 58 (4) :* 306-310.
6. Goswami, T.N. and Mukhopadhay, A.K. (2013). Distribution pattern of diamondback moth, Plutella xylostella on cabbage under gangetic alluvial condition of west Bengal. *Hortiflora Research Spectrum, 2 :* 145-149.