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INCIDENCE AND ABUNDANCE OF BRINJAL SHOOT AND FRUIT BORER *LEUCINODES ORBONALIS* GUENEE

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ABSTRACT
Based on the experiments conducted at Vegetable Research Station, Kalyanpur, Kanpur under Chandra Shekhar Azad University of Agriculture and Technology, U.P, the infestation and intensity of *Leucinodes orbonalis* Guenee on young plants were recorded by counting infected and healthy shoots on randomly selected ten plants. The results of two consecutive years revealed that the adults population of brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee fluctuated to a great deal not only from year to year but also in different months. Adult increased considerably in the month of October and November and decreased in subsequent weeks of December. The maximum temperature and abundance of moth showed a positive correlation (r = 0.319) during both the years. The correlation coefficient of minimum temperature and moth trapping also came out was positive (r = 0.3893) indicating the minimum temperature plays an important role in building up of moth population.

INTRODUCTION

Brinjal (*Solanum melongena* L.), which is commonly known as eggplant is one of the most important solanaceous kharif or summer season vegetable crop in our country. It occupies an important position among the other regular vegetable crops that are available throughout the year.

In India, brinjal crop can be grown on the wide range of soils and other variable environmental conditions. In Kanpur and its suburban areas *Leucinodes orbonalis* Guenee is a major pest of brinjal crop. On an average about 20.7% fruits gets damaged by this shoot and fruit borer and even if the damaged portion of fruits is discarded, the loss in weight is ~ 9.7% (Peswani and Lal, 1964).

Attempts have been made to control this notorious pest with the use of different insecticides (Jotwani and Sarup, 1963; Joshi and Sharma, 1973; Mehto and Lall, 1981; Nimbalkar and Ajri, 1981; Singh and Kavadia, 1988; 1989 a and b). These researchers have used cypermethrin, deltamethrin, fenvalerate, permethrin, methomyl, endosulfan, carbaryl thiometon, aldicarb and many fourth generation insecticides to control the population of brinjal shoot and fruit borer.

The indiscriminate and incessant use of hazardous chemicals on agricultural commodities, resulted in the pest resurgence, outbreak of secondary pests, resistance in insects to insecticides, adverse effects on beneficial insects, wild life and ultimately to men through food chain system.

Keeping the aforesaid reasons in view and for the economic significance of pest needs to be gained in terms of level of pest population, quantum of the extent of injury and consequent loss is prerequisite for development of management schedules for any pest. The present study was therefore planned with *Leucinodes orbonalis* Guenee (Lepidoptera: Pyraustidae) which is a serious and polyphagons pest having the marked preference for brinjal.

MATERIALS AND METHODS

The studies on incidence and seasonal abundance of *Leucinodes orbonalis* Guenee were conducted during the year 1999-2000 and 2000-2001 on brinjal variety 'Azad Kranti' at Vegetable Research Station, Kalyanpur and postgraduate Department of Zoology, D. B. S. College, Kanpur (Fig. 1). The incidence of *Leucinodes orbonalis* Guenee was recorded at seven days intervals in the first experiment starting from the first appearance of shoot and fruit forer after transplanting the brinjal crop and continued till the harvesting of the crop. The infestation and intensity of *Leucinodes orbonalis* Guenee on young plants were recorded by counting infected and healthy shoots on randomly selected ten plants from each sub plot. The catches of larvae and adults during the same 1999-2000 and 2000-2001 were also recorded and statistically correlated with the meteorological conditions.

RESULTS AND DISCUSSION

It is evident from the Table 1 that the larval infestation of the pest occurred first time in the week of August in both the years during investigation. The peak of larval population was recorded from third week of September to third week of October in both the years. Thereafter, there was a sudden

decline in the population of adults of *Leucinodes orbonalis* Guenee. Larval population also declined from third week of November in both years of study. It is evident from records during the year 1999-2000, the larval population was found in descending order after the second week of November in experimental field during both years. From third week of September to third week of October, the larval number was about the same but from the second week of November, the population of larvae declined.

So the highest average population was observed in the third and last week of October and the lowest population was recorded from third week of December to first week of January 2000. From second week of December to first week of January 2000 no adult population was observed.

The larval populations in all four fields do not differ significantly. It can further be seen from the Table 1 that the observed data do not manifest the significance difference in larval population in all the four fields surveyed but statistically data have the significant impact with regard to larval population buildup.

The statistical analysis for the year (1999-2000) also reveal that interaction has no significant effect on larval population of *Leucinodes orbonalis* Guenee. However, the larval population varied significantly in the fields surveyed at different times.

During the year (2000-2001) it is evident from the Table 1 that the larval population was found in descending order in month of November to first week of January. The maximum population was recorded in third and fourth week of October.

Further the analysis revealed that during both the years the different fields differed significantly with respect to the larval population increase or decrease. However, the abundance of larvae was not due to the type of host plant but the maximum or minimum increase or decrease in larval and adult population was due to the prevailing ecological conditions. Because statistically the highly significant values were obtained in both the years of investigation.

The interaction effect of host species and periods had not the pronounced effect on larval population as the non-significant values were obtained during both the years of investigation. Nevertheless, the host species and periods did not effect the larval population independently.

Over and above, it is amply documented from the analysis that the main effect in building up of larval population is mainly due to the periods associated with biotic and abiotic factors.

From the findings of both the years of study it can conclusively

Table 1: Shoot and fruit damage by *Leucinodes orbonalis* Guenee relation to environmental factors on brinjal

Date of Observation	Shoot damage (%)		Fruit damage (%)	
	Infestation (%)	Intensity/plant	By number	By weight
August 18, 99	0.0	-		
August 25, 99	16.66	0.16		
September 1	73.00	0.93		
8	50.60	1.23		
15	53.38	1.36		
22	60.66	2.68		
29	86.66	2.90		
October 06	80.00	2.56		
13	50.00	1.73	16.66	13.72
20	53.33	1.50	33.33	33.33
27	40.00	1.33	66.66	66.66
November 3	16.66	0.16	33.33	33.33
10	26.50	0.36	16.66	13.72
17	0.0	0.20	7.77	5.75
24			9.76	9.29
December 1			6.34	3.67
8			5.39	2.24
15			5.92	3.22
22			12.28	8.69
29			7.32	3.97
January 05			0.0	0.0

Table 2: Correlation (r) with environmental factors

Parameters	Shoot damage (%)		Fruit damage (%)	
	Infestation (%)	Intensity/plant	By number	By weight
Temperature (ºC)				
Maximum	0.218	0.168	0.698	0.712
Minimum	0.814	0.627	0.686	0.698
Average	0.872	0.648	0.707	0.713
Relative humidity				
Maximum	0.508	0.356	-0.206	-0.235
Minimum	0.394	0.239	-0.643	-0.688
Average	0.450	0.327	-0.428	-0.580
Rainfall (mm)	-0.482	-0.551	-0.668	-0.208

1.Significant at 5% level; 2.Significant at 1% level; Significant at 0.1% level

Table 3: Seasonal abundance of *Leucinodes orbonalis* Guenee (larvae/ adults) in the year 1999-2000 and 2000-2001

Month and Year	No. of Adults trapped/week (Mean ± SD)	No. of larvae trapped/week (Mean ± SD)
August 1999	3 ± 2.16	4.4 ± 3.36
September 1999	21.75 ± 10.9	12.5 ± 2.65
October 1999	25 ± 10.5	23.6 ± 9.0
November 1999	2.75 ± 1.5	18 ± 10.9
December 1999	0.25 ± 0.5	4.25 ± 3.95
January 2000	6 ± 7.81	1.8 ± 0.84
February 2000	18.75 ± 2.98	7 ± 2.94
March 2000	13.5 ± 2.38	20.5 ± 4.43
April 2000	9.2 ± 6.72	18.6 ± 6.5
May 2000	1.66 ± 1.15	2 ± 1
June 2000	1.33 ± 0.57	1 ± ( )*
July 2000	3.25 ± 1.7	2 ± 0.81
August 2000	2.33 ± 1.52	1.75 ± 0.95
September 2000	21 ± 10.9	12 ± 1.82
October 2000	7.95 ± 4	24 ± 8.21
November 2000	2 ± 1.41	17.75 ± 9.63
December 2000	1.5 ± 0.70	5.4 ± 4.15
January 2001	2.33 ± 1.52	1.75 ± 0.95
February 2001	11.25 ± 8.65	2.66 ± 1.52
March 2001	13.25 ± 2.87	20.75 ± 4.11
April 2001	9.0 ± 7.0	19.8 ± 5.49
May 2001	1.33 ± 0.57	1.66 ± 0.57
June 2001	1.5 ± 0.7	1.33 ± 0.57
July 2001	3.25 ± 2.0	1.8 ± 0.83
August 2001	2.5 ± 1.91	4 ± 3.6
September 2001	21.4 ± 10.0	11.8 ± 2.77

be said that larval and adult population of *Leucinodes orbonalis* Guenee and more significantly affect with regard to the ecological factors that the host plants planted for present study. The maximum number of larvae was observed in third and fourth weeks of October and in first week of November in both years during present investigation.

The results of two consecutive years revealed that the adult's population of *Leucinodes orbonalis* Guenee fluctuated to a great deal not only from year to year but also in different months. However, the general trend for population build up was more or less the same except that higher moth population was observed during 2000-2001 as compare to 1999-2000. It is obvious from the Table 1 that adult catches in 2000-2001 increased considerably in the month of October and November and decreased in subsequent weeks of December 2000.

From the foregoing results it is obvious that emergence of the moth begins with the onset of monsoon rains but their heavy populations were observed in the month of October during both the years of study. This may be one of the possible reasons because of which the out break of *Leucinodes orbonalis* Guenee larvae occurred in the second week of August during the course of present investigation.

It is obvious from the data of the Table 1 that the simple correlation between rainfall and moth capturing during 1999-2000 had the positive (r = 0.286) influence on the population of *Leucinodes orbonalis* Guenee. Similarly, in 2000-2001 also,

Figure 1: A brinjal field at C.S. Azad University of Agriculture and Technology surveyed for the study of incidence and seasonal abundance of *L. orbonalis*

rainfall resulted in positive correlation (r = 0.468) during both years of study their association was non-significant so it clearly indicates the population of *Leucinodes orbonalis* Guenee increased in rainy seasons.

As regards the correlation between atmospheric maximum temperature and presence of pest, it is amply documented from the data of Table 1 that maximum temperature and presence of moth has the positive correlation (r = 0.319) during both years but they were non significantly correlated that is, as the maximum temperature decreases moth population also decreases. Their non-significant values during both the years demonstrate that although they are directly correlated. But there is no significant impact of maximum temperature on the population of moth.

The correlation coefficient of minimum temperature and moth trapping came out with positive (r = 0.3893) correlation during the period of study. Thus, it clearly indicates that the minimum temperature plays an important role in building up of moth population.

During both years of study the negative correlation and non-significant values of relative humidity with adult trapping show that there is no impact of relative humidity on moth fluctuation and it also discourages the moth prevalence.

It may also be inferred from Table 1 that wind velocity has inverse response with adult trap catches during both the years of study. In 1999-2000, the wind velocity was found to be negatively correlated with their significant value (t = 2.236) meaning thereby that wind velocity significantly discouraged the moth prevalence contrary during 2000-2001, wind velocity was positively correlated, but its value was non significant. Thus it appears from the findings that wind velocity adversely effect the moth population.

As regards the impact of evaporation rate, the observed data clearly shows that evaporation rate is positively correlated with moth trapping. It shows that as the evaporation rate increases moth prevalence also increases but there appears no significant impact.

Atwal and Verma (1972) reported the abundance of *Leucinodes orbonalis* Guenee during monsoon period. Many workers also observed maximum population increase of moth between 22 to 35ºC. Lal (1975) observed this borer throughout the year except during severe winter. Mehto *et al.,* (1980) also observed this pest round the year on brinjal crop. Pawar *et al.,* (1986) reported incidence of this pest during kharif crop and summer seasons. The peak population of this borer was observed in second week of February and first week of summer while shukla (1989) observed peak population of this borer in first week of July and third week of August. The population was found correlated with average temperature, mean relative humidity and total rainfall. Patel *et al.,* (1988) and Dhamdhere *et al., (*1995) found moderate temperature and high humidity favoured the population build up of *Leucinodes orbonalis* Guenee during the summer. Tripathi and Singh (1991) observed declination in population in second and fourth generation. These findings are in full agreement with the observations of this investigation. Gupta *et al.,* (1987) also found that abiotic factors are responsible for population build up. Prasad and Logiswaran (1997) revealed a significant positive correlation with maximum temperature and relative humidity and negative co-relation with minimum temperature. These findings are also in favour of present findings.

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