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Seasonal Incidence of Shoot and Fruit Borer (*Leucinodes orbonalis* Guenee) of Brinjal in Mid-Hills of Meghalaya

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ABSTRACT

The field experiments were conducted at Entomology Research Field, ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya during *kharif*- 2015 and spring-2016 to study the seasonal incidence of shoot and fruit borer of brinjal with reference to different dates of transplanting. The experiment was laid out in randomized block design (RBD) with three replications. Seedlings of brinjal (variety: chhaya) were raised in three different nursery beds for different date of transplanting during each year. Brinjal seedlings (30days old) were transplanted in the plot size of 5m x 3m. Weekly observations were taken from randomly selected 5 tagged plants/ plot for brinjal shoot and fruit borer infestation on shoot from each planting. For fruit infestation, total number of fruits and infested fruits were recorded/plot during each harvesting from each replication. During 2015, considering the whole experimental period from April to September, it was observed that peak infestation of shoot and fruit borer on shoot and fruit were in the 1st week of August (34.20%) and in the 3rd week of August (46.75%), respectively whereas in 2016, irrespective of planting, the peak infestation on shoot and fruit were observed in the 4th week of April (21.00%) and 4th week of May (17.55%), respectively. Relative humidity had positive influence on fruit infestation during both the years.

1. Introduction

Brinjal or eggplant (*Solanum melongena* L.) is an important solanaceous crop of sub-tropics and tropics. Brinjal is referred as "King of vegetables". Immature fruits are used primarily as cooked vegetable and popular for the preparation of various dishes in different regions of the country. Generally fruits are moderate sources of vitamins (Vitamin A and B) and minerals like phosphorous, calcium, iron and nutritive value varies from variety to variety. Brinjal is also valued for its medicinal properties. In native medicines, role of brinjal in treatment of liver diseases, cough due to allergy, rheumatism, colilithiasis, leucorrhea and intestinal worms has been mentioned. India is the second largest producer of brinjal in the world next to China. The global area under brinjal cultivation has been estimated at 1,600,000 ha with total production of brinjal fruit of about 50 million MTs (FAO data, 2012) whereas India accounts for about 13.4 million MTs with an area of 711.3 ('000 MT) under cultivation. The total area under brinjal cultivation in Meghalaya is 0.96 ('000 HA) with production of 13.05 ('000 MT) (Meghalaya agri. Profile, 2006). Brinjal production is in threat in recent years, due to increased cost of production on management of insect pest and disease complex. In a brinjal ecosystem, among the insect pests, brinjal (eggplant) fruit and shoot borer (*Leucinodes orbonalis* Guenee) is the most destructive and key pest of eggplant (Latif *et al*., 2010; Chakraborti and Sarkar, 2011; Saimandir and Gopal, 2012) inflicting sizeable damage in almost all the eggplant growing areas (Dutta *et al*., 2011). The pest poses a serious problem because of its high reproductive potential, rapid turnover of generations and intensive cultivation of brinjal both in wet and dry seasons of the year. Eggplant shoot and fruit borer (ESFB) is practically monophagous but attacks other plants which belong to solanaceae family and attained

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global importance in recent years (Ahmad *et al*., 2007). The adult moth of ESFB lays eggs on the leaf and hatched larvae move into the fruits. The young larvae are an internal feeder that bore and damages the tender shoots and fruits adversely affecting plant growth, yield and fruit quality making it unfit for human consumption and unmarketable. The yield reduction is reported to be around 20-30 percent (Bhargava *et al.,* 2008) as high as 70 percent (Dhandapani *et al*., 2003) and may up to 80 percent by both yield and content of vitamin C deteriorating consumer appearance (Sharma, 2002). In Meghalaya, the major constraints of brinjal production are heaviest infestation of insect pests. About 27 insect pests were recorded in this area that infests the brinjal crop (Singh and Singh, 2002). Among the insect pests, brinjal shoot and fruit borer (*Leucinodes orbonalis* G.) is the major one and causes severe damage as agro-climatic conditions of Meghalaya are very conducive for the development of the brinjal shoot and fruit borer. It has been reported as a major pest in Khasi hill of Meghalaya causing 26.3-62.5% fruits damage whereas jassids, white fly, epilachna beetle, aphids, flea beetle have been reported as minor pests (Gangwar and Sachan, 1981). Indiscriminate use of conventional insecticides for management of brinjal shoot and fruit borer has lead to several problems such as reducing the population of beneficial organisms, resurgence of secondary pests, pesticides residues in edible brinjal fruits and health hazards (Kabir *et al.,* 1996). Therefore, there is an urgent need to adaptation of non chemical management practices to reduce the incidence of target pests on a particular crop. Manipulation of date of transplanting of any crops may reduce the incidence of major pests that may indirectly reduce the number of spray application for their management. Therefore, it is necessitate acquiring knowledge about their peak incidence pattern during growing periods. Keeping these views in mind, the present experiments were undertaken to study the seasonal incidence of shoot and fruit borer of brinjal with reference to different dates of transplanting.

2. Materials and Methods

The field experiments were conducted at Entomology Research Field, ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya during *kharif*- 2015 and spring-2016 to study the seasonal incidence of shoot and fruit borer of brinjal with reference to different dates of transplanting. The experiment was laid out in randomized block design (RBD) with three replications. Seedlings of brinjal (variety: chhaya) were raised in three different nursery beds for different date of transplanting during each year. Brinjal seedlings (30days old) were transplanted in the plot size of 5m x 3m. During 2015, first planting was started in the mid of April and subsequently another two plantings were done at 15 and 30 days after first planting. During, 2016 first planting was started in the first week of February and subsequently another two plantings were done at 15 and 30 days after first planting. Weekly observations were taken from randomly selected 5 tagged plants/ plot for brinjal shoot and fruit borer infestation on shoot from each planting. For fruit infestation, total number of fruits and infested fruits were recorded/plot during each harvesting from each replication. Then percentage of infested shoot/fruit was recorded by the following formula:

$$\textbf{\% Shoot/fruit infestation} = \frac{\text{Number of infested shoots/fruits}}{\text{Total number of shoots/fruits}} \times 100$$

The important weather parameters were collected from Agromet Advisory, Division of Agricultural Engineering, ICAR Research Complex, NEH Region, Umiam to correlate with infestation of shoot and fruit borer of brinjal.

3. Results and Discussion

3.1 Incidence pattern of L. orbonalis in shoot and fruit in different plantings during 2015

Effect of date of transplanting on shoot and fruit borer infestation in shoot as well as fruit is presented in Fig.1 and Fig.2, respectively. Results revealed that among the three different dates of transplanting, first transplanting showed lowest shoot and fruit infestation while third transplanting recorded highest shoot and fruit infestation. In first transplanting (15th April, 2015), shoot infestation started from the 4th week of May persisted up to 2nd week of August and infestation varied from 3.50% to 28.25%. The peak shoot infestation (28.25%) was observed in the second week of July. In case of fruit infestation (at each picking), infestation started from the third week of June and sustained up to third week of August and infestation varied from 3.55% to 16.25%. The peak fruit infestation (16.25%) was noticed in the first week of August. In second transplanting (30th April, 2015), shoot infestation started from the fourth week of May and it remains up to fourth week of August. Infestation varied from 2.25% to 32.60% with peak of 32.60% in the first week of August. Fruit infestation started from the fourth week of June and persisted up to first week of September. The highest fruit infestation (44.75%) was observed in the third week of August. In third transplanting (15th May, 2015), first shoot and fruit infestations were noticed in the second week of June and third week of July, respectively and continued till second and third weeks of September, respectively.

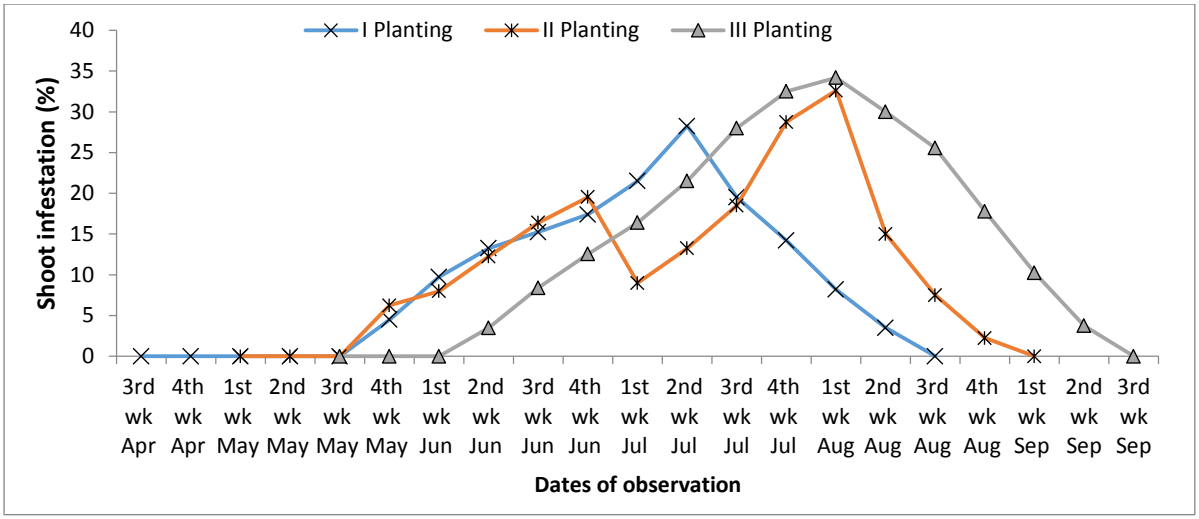

Figure 1. Incidence pattern of *L. orbonalis* in shoot in different planting during 2015

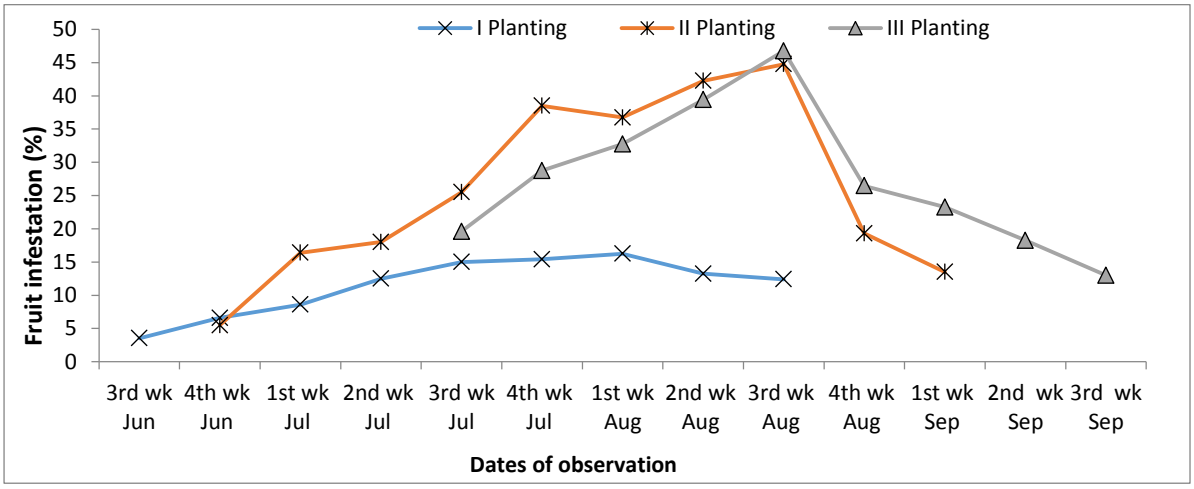

Figure 2. Incidence pattern of *L. orbonalis* in fruit in different planting during 2015

Infestations were varied from 3.50 to 34.20% and13 to 46.75% on shoot and fruit, respectively. The peak infestation was observed in shoot (34.20%) and fruit (46.75%) in first week of August and third week of August, respectively. Considering the whole experimental period from April to September, it was observed that peak infestation of shoot and fruit borer on shoot and fruit were in the 1st week of August (34.20%) and in the 3rd week of August (46.75%), respectively.

3.2 Incidence pattern of L. orbonalis in shoot and fruit in different plantings during 2016

Effect of date of transplanting on shoot and fruit infestation in 2016 is depicted in Fig.3 and Fig. 4, respectively. During 2016, infestation on shoot and fruit were less as compared to 2015. Lowest shoot and fruit infestation were observed in second and first transplanting, respectively whereas in third transplanting highest infestations were found on both shoot and fruit. In second season, shoot and fruit borer infestation started in the 1st week of March and continued up to 3rd week of June irrespective of planting dates. In first transplanting (3rd February, 2016), shoot and fruit infestation ranged from 2.25 to 21% and 2.40 to 9.75% with the peak of 21 and 9.75% on shoot and fruit, respectively in the 4th week of April. In second transplanting (18th February, 2016), shoot infestation was started from the 2nd week of March and fruit infestation was started from 3rd week of April and remains till 1st week of June with peak infestation of 17.25% on shoot in the 1st week of May and 12.80% on fruit in the 3rd week of May. In third transplanting (4th March, 2016), shoot infestation was started from the 4th week of March and fruit infestation was started from the 1st week of May and infestation sustained till 3rd week of June. Shoot and fruit infestation varied from 3.4 to 17.55% and 1.45 to 18.45% with the peak of 17.55% on shoot and 18.45% on fruit in the 3rd and 4th week of May, respectively. Irrespective of planting, the peak infestation on shoot and fruit were observed in the 4th week of April (21.00%) and 4th week of May (17.55%), respectively.

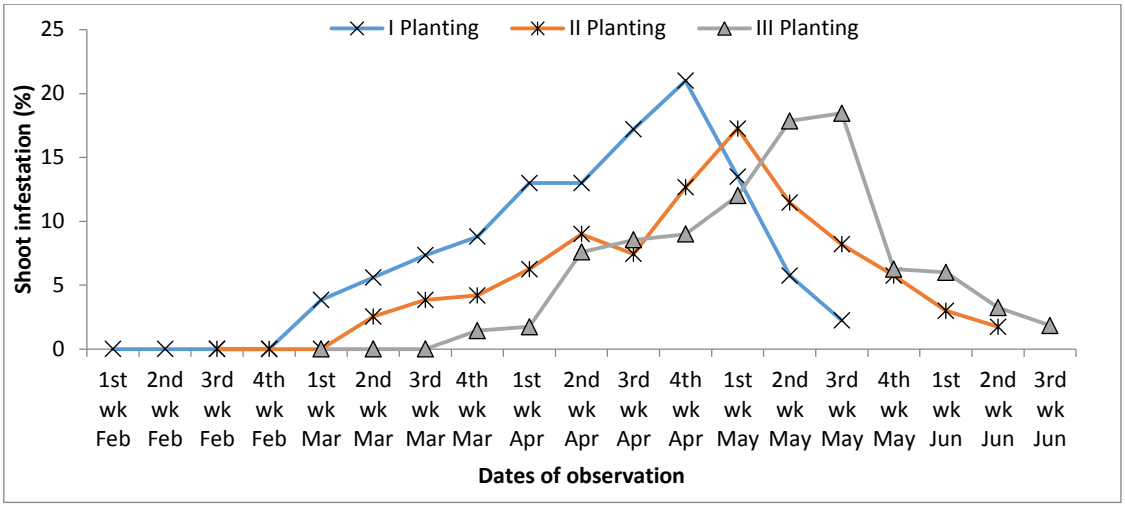

Figure 3. Incidence pattern of *L. orbonalis* in shoot in different planting during 2016

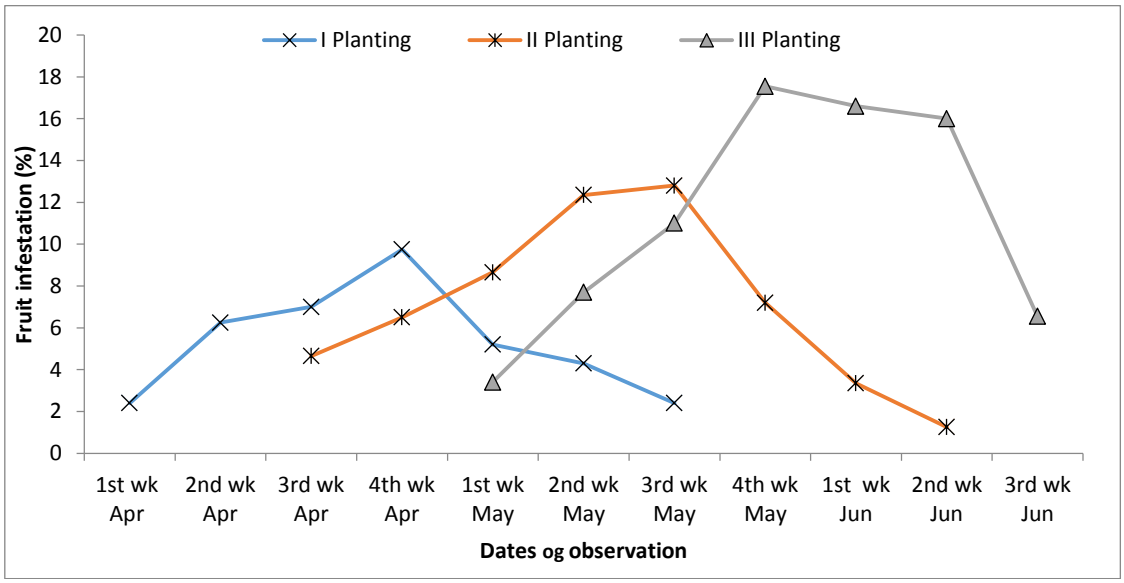

Figure 4. Incidence pattern of L. orbonalis in fruit in different planting during 2016

3.3 Effects of weather parameters on incidence of shoot and fruit borer of brinjal

Correlation studies between weather parameters and shoot and fruit borer infestation on second planting of 2015 and 2016 are presented in Table 1. Shoot infestation in 2015 revealed that minimum temperature (^{0}C) showed positive significant relationship whereas maximum temperature showed negative relationship. All other weather parameters (average temperature, maximum, minimum, average relative humidity and rainfall) showed positive influence on shoot infestation. In case of fruit infestation (2015), minimum relative humidity (%) and rainfall showed significantly positive relationship whereas other parameters showed negative relationship. During 2016, Minimum temperature, minimum and average relative humidity showed positive response whereas other factors showed negative response on shoot infestation.

Relative humidity (maximum, minimum and average) had positive influence on fruit infestation whereas all temperatures and rainfall had negative influence on fruit infestation. During first season, peak infestation of shoot and fruit borer on shoot and fruit were in the 1st and 3rd week of August, respectively whereas in second season, the peak infestation on shoot and fruit were observed in the 4th week of April and 4th week of May, respectively. During both the seasons weather parameters particularly relative humidity had impact on population built up of brinjal shoot and fruit borer. Population of shoot and fruit borer (*L. orbonalis* G.) began to increase from the first week of July and peaked infestation was observed during the third week of August (Shukla, 1989) whereas Saeed and khan (1995) reported that infestation of shoot and fruit borer began soon after brinjal started fruiting, infestation peaked on 25 August, then declining but remaining fairly constant during September-November.

Table 1. Correlation coefficient (r) between shoot and fruit borer infestation (on second planting) and weather parameters

FSB Infestation (%)	Temperature (^{0}C)			Relative humidity (%)			Rainfall (mm)
	Maximum	Minimum	Average	Maximum	Minimum	Average	
2015							
Shoot infestation	-0.028	0.529*	0.388	0.281	0.448	0.497	0.072
Fruit infestation	-0.443	-0.092	-0.384	-0.618	0.694*	0.235	0.672*
2016							
Shoot infestation	-0.051	0.018	-0.004	-0.059	0.229	0.142	-0.279
Fruit infestation	-0.258	-0.539	-0.413	0.116	0.193	0.165	-0.418

*significant at 0.05% level

The present findings are partially agreement with reports of Rashid *et al.* (2003) who revealed that the highest level of shoot and fruit borer infestation was found from June to September. Radhakrishore *et al.* (2009) observed that infestation of *L. orbonalis* on brinjal crop started from the early vegetative stage and continued up to crop maturity. First infestation appeared on shoots from the second week of April and peaked in the second week of June and third week of May during two consecutive years. The present investigations are in conformity with the findings of Singh *et al.* (2009) who reported that shoot infestation occurred during fourth week of August and the incidence was found to be non-significant relationship with temperature, relative humidity and rainfall. Singh *et al.* (2011) reported that the peak infestation of this pest on shoots was observed in the first week of June and fourth week of May while the peak incidence on fruits was observed during the second week of June and third week of June in two successive cropping seasons, respectively. Same authors also found that average temperature and relative humidity had significant positive association whereas average sunshine had significant negative association with the infestation of the pest on brinjal crop. Results are in the line of Naqui *et al*. (2009) who reported that relative humidity showed positive significant effect on shoot and fruit borer but rainfall had no effect on shoot and fruit borer infestation. During experiment it was observed that peak infestation of shoot and fruit borer was in the month of August during *kharif* season, therefore, present study concludes that early planting may be recommended for reducing the incidence of brinjal shoot and fruit borer.

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References

Ahmad, M., Arif, M.I., and Ahmad, M. (2007). Occurrence of insecticide resistance in field populations of *Spodoptera litura* (Lepidoptera: Noctuidae) in *Pakistan J Crop Prot* 26: 809-817.

Bhargava, M.C., Choudhary, R.K. and Jain, P.C. (2008). Genetic engineering of plants for insect resistance. In: P.C. Jain and M.C. Bhargava (eds.). Novel App. roaches. New India Publishing. New Delhi, India. pp. 133-144.

Chakraborti, S. and Sarkar, P.K. (2011). Management of Leucinodes orbonalis Guenee on eggplant during the rainy season in India *J Plant Prot Res* 51: 325-328.

Dhandapani, N., Shelkar, U.R., and Murugan, M. (2003). Bio-intensive pest management in major vegetable crops: An Indian perspective. *J Food, Agric Environ* 1(2): 330-339.

Dutta, P., Singha, A.K., Das, P., and Kalita, S. (2011). Management of brinjal fruit and shoot borer, *Leucinodes orbanalis* Guenee in agro-ecological condition of West Tripura. *Scholarly J Agric Sci* 1(2): 16-19

Food and Agriculture Organization (FAO). Agriculture Database, 2012. http://faostat.fao.org/. Accessed 25 May 2016.

Gangwar, S.K. and Sachan, J.N. (1981). Seasonal incidence and control of insect pest of brinjal with special reference to shoot and fruit borer, *Leucinodes orbonalis* Guenee. in Meghalaya. *J Res* 2(2): 187-192.

Kabir, S., Bal. S.S., Singh, G., Sidhu, A.S., and Dhillon, T.S. (1996). Management of brinjal fruit and shoot borer, *Leucinodes orbonalisGuenee* through net house cultivation. *Acta Horticulturael* 659: 345-350.

Latif, M.A., Rahman, M.M. and Alam, M.Z. (2010). Efficacy of nine insecticides against shoot and fruit borer, *Leucinodes orbonalis* Guenee (Lepidoptera: Pyralidae) in eggplant. *J Pest Sci* 83: 391-397

Meghalaya Agriculture Profile. Agricultural information Wing, Directorate of Agriculture, Meghalaya, 2006

Naqui, A.R., Pareek, B.L. and Mitharwal, B.S. (2009). Seasonal incidence of shoot and fruit borer (*Leucinodes orbonalis* Guene) infesting brinjal in hyper arid region of Rajastan. *J Insect Sci* 22(2): 195-198.

Radhakrishore, R.K., Devjani, P. and Singh, T.K. (2009). Population dynamics of *Leucinodes orbonalis*. *Annals of Plant Protection Sciences* 17(2): 459-529.

Rashid M.A., Alam S.N, Rouf, F.M.A. and Talekar, N.S. (2003). Socio economic parameters of brinjal pest control in Jessore district of Bangladesh. Technical Bulletin No. 29. Shanbua, Taiwan. AVRDC-The world vegetable centre. AVRDC publication No. 03. Pp. 29.

Saeed M.Q., khan I.A. (1997). Population abundance and chemical control of brinjal fruit borer *Leucinodes orbonalis* Guen. (Pyralidae, Lepidoptera). *Sarhad J Agric* 13(4): 399-402.

Saimandir J., Gopal, M. (2012). Evaluation of synthetic and natural insecticides for the management of insect pest control of eggplant (*Solanum melongena* L.) and Pesticide Residue Dissipation Pattern. *American J Plant Sci* 3(2): 214-227.

Sharma D.R. (2002). Bioefficacy of certain insecticide and biopesticides against major pest of brinjal under field condition. M. Sc. Thesis, Indian Agriculture Research Institute, New Delhi, India. Pp. 160.

Shukla R.P. (1989). Population fluctuation of *Leucinode sorbonalis* and on brinjal (*Solanum melongena*) in relation to abiotic factors in Meghalaya *Indian J Agric Sci* 59(4): 260-264.

Singh D. K., Singh R., Datta S. D, Singh S. K. 2009. Seasonal incidence and insecticidal management of shoot and fruit borer (*Leucinodusorbonalis L.)* in brinjal. Annals of Horticulture 2(2): 187-190.

Singh R.K.R., Singh J. K, Shah, M.A.S. (2011). Population incidence of brinjal, (Lepidoptera; Pyralidae) in Manipur *J Exp Zool* 4(1): 229-232.

Singh Y.P., Singh P.P. (2002). Natural parasites and extent of parasitism to shoot and fruit borer (*Leucinodes orbonalis*) of brinjal (*Solanum melongena*) at medium high altitude hills of Meghalaya. *Indian J Entomol 64(2): 222-226*