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To assess the crop losses due to shoot and fruit borer, *Leucinodes orbonalis* (L.) Guen. in brinjal

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Abstract
The present experiment was carried out in *Kharif* seasons at horticulture farm, S.K.N. College of Agriculture, Jobner during, 2015. The mean fruit yield obtained was 223.48 q ha^{-1} in plots treated with alternate sprays of acephate (0.05%) and malathion (0.05%), while it was only 115.15 q ha^{-1} in untreated plots. The yields obtained from protected and unprotected plots differed significantly and the difference in yield was 108.33 q ha^{-1}. The per cent increase in yield over untreated control and avoidable loss were 94.07 and 48.47 Per cent, respectively. If the losses due to *L. orbonalis* could be avoided by pest control measures, the production can be appreciably increased.

Keywords: Shoot and fruit borer, *L. orbonalis,* brinjal, crop losses, insecticides

Introduction
Brinjal, *Solanum melongena* (L.) also known as eggplant, belongs to family solanceae. It is native of India and is grown throughout the country except in higher altitudes [1]. The brinjal crop is attacked by a number of insect-pests right from germination to harvesting of the crop viz., shoot and fruit borer, *Leucinodes orbonalis* (L.) Guen., jassid, *Amrasca biguttula biguttula* (Ishida), aphid, *Aphis gossypii* Glover, lace wing bug, *Urentius echinus* Distant, epilachna beetle, *Epilachna vigintioctopunctata* Fab. and stem borer, *Euzophera perticella* Ragonot. Among these insects, shoot and fruit borer, *L. orbonalis* is one of the major constraints in achieving potential yield and remain active throughout the year with many overlapping generations. This pest is reported from all brinjal growing areas of world including Germany, Burma, USA, Srilanka and india. The shoot and fruit borer inflicting yield losses as high as 85-90 per cent [2, 3, 4] has now been considered as the key pest of brinjal [5, 6, 7]. Crop losses have been reported to the tune of 20-89 per cent in various parts of India by this pest [8]. The caterpillar of the pest initially attacks the terminal shoot and bore inside as a result of which, drooping and wilting of the shoots occur. In the later stage, it also bores into the young fruits by making holes and feeds inside. Such fruits, being partially unfit for human consumption and lose their market value [9]. In order to prevent the infestation of the pest and to produce a quality crop, it is essential to manage the pest population at appropriate time with suitable control measures. Keeping these points in view the present study will be undertaken to evolve the management strategy against *L. orbonalis* through alternate spray of safer insecticides.

Materials and Methods
The experiments were carried out during *Kharif* season at horticulture farm, S.K.N. College of Agriculture, Jobner during, 2015. The experiment will be laid out in Simple Paired Plot Design (Paired t-test) with two treatments, *viz.,* treated and untreated, each replicated eight times. The plot size was 3.0 x 3.0 m^2 with row to row and plant to plant distance of 60 cm and 50 cm, respectively. The plots were treated with alternate sprays of acephate 75 SP (0.05%) and malathion 50 EC (0.05%) at weekly interval. The fruit yield of treated and untreated plots will be recorded at each picking of fruits. The data of fruit yield obtained were converted into quintal per hectare to interpret the results of crop losses inflicted by incidence of insect pests on brinjal by paired 't' test. The avoidable loss and increase in yield of fruits over control (untreated) was calculated for each treatment by following formula [10].

$$\text{Avoidable Loss (\%)} = \frac{\text{Yield in treated plot - Yield in untreated control plot}}{\text{Yield in treated plot}} \times 100$$

$$\text{Increase in yield (\%)} = \frac{\text{Yield in treatment – Yield in untreated control}}{\text{Yield in untreated control}} \times 100$$

Results and Discussion

The mean fruit yield obtained was 223.48 q ha^{-1} in treated plots and 115.15 q ha^{-1} in untreated plots (Table 4.1 and fig. 4.1). The calculated t-value was greater than the tabulated t-value (2.14, df-14) at the 5 per cent level of significance and was proved to be significant. Therefore, the yield obtained in two treatments (treated and untreated) during the study differed from each other significantly. In present investigation, the difference between the mean fruit yield of treated to untreated (increase in yield over untreated) during *Kharif*, 2015 was 108.33 q ha^{-1}. The per cent increase in yield over untreated control and avoidable loss were 94.07 and 48.47 Per cent, respectively. If the losses due to *L. orbonalis* could be avoided by pest control measures, the production can be appreciably increased.

This suggests that if the losses due to *L. orbonalis* could be avoided by pest control measures, the production can be appreciably increased. These results are in agreement with those of [11] reported the apparent losses caused by borer on fruits were 18.70 to 20.07 per cent, whereas total losses were up to the tune of 34.36 to 36.53 per cent, out of which avoidable losses were 33.60 to 36.19 per cent. The crop loss due to shoot and fruit borer are corroborated with those of [12] reported that the apparent losses caused by shoot and fruit borer on the fruits of brinjal were 19.4 to 20.2 per cent, whereas total losses were up to the tone of 35.2 to 36.4 per cent, out of which avoidable losses were 34.0 to 36.1 per cent. Similarly, [13] was also reported that the damaged fruits and fruit weight loss due to *L. orbonalis* varied from 3.76 to 45.45 per cent and 3.00 to 67.71 per cent in first year and 5.71 to 44.26 per cent and 3.00 to 51.33 per cent in second year. [14, 15, 16, 17] support the present findings. The varied damage caused by the pest of brinjal was due to the varied biotic and abiotic factors of various localities.

Table 1: Assessment of crop losses due to shoot and fruit borer, *Leucinodes orbonalis* (L.) Guen. to brinjal crop in *Kharif*, 2015

Treatment	Yield (q ha^{-1})	Increase in yield over untreated control (%)	Avoidable loss (%)
Treated	223.48	94.07	48.55
Untreated control	115.15		
Increase in yield	108.33		
t-cal.	18.72		

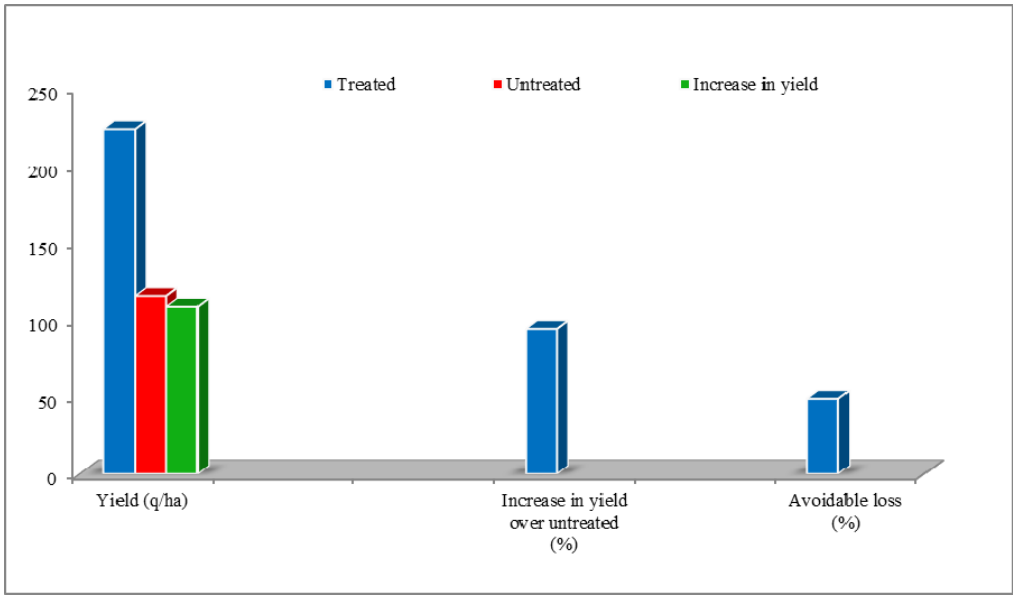

Fig 1: Assessment of crop losses due to *Leucinodes orbonalis* (L.) Guen. to brinjal crop in Kharif, 2015

Conclusion

The mean fruit yield obtained was 223.48 q ha^{-1} in plots treated with alternate sprays of acephate (0.05%) and malathion (0.05%), while it was only 115.15 q ha^{-1} in untreated plots. The yields obtained from protected and unprotected plots differed significantly and the difference in yield was 108.33 q ha^{-1}. The percent increase in yield over untreated control and avoidable loss were 94.07 and 48.47 per cent, respectively.

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