

Impact of Infested Shoot Removal and Light Trap on *Leucinodes orbonalis* Infestation on Eggplant Fruit

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ABSTRACT

Brinjal (*Solanum melongena* L.) belongs to family Solanaceae is a very important vegetable, cultivated in many countries including Pakistan. The several insect pests are attacking the different parts of brinjal but brinjal shoot and fruit borer (BSFB), *Leucinodes orbonalis* G. is the major pest. The current study was carried out on spring sown crop during 2018, from 15 April – 30 September. The aim of study was to checked the effect of cultural (infested shoot removal) and mechanical practices (light trap) on *Leucinodes orbonalis* G infestation on brinjal fruit. The brinjal variety, Nirala was obtained were obtained from Ayyub Agriculture Research Institute. The experiment was laid out in Randomized Complete Block Design (RCBD) with four treatments each repeated three times. The treatments were T1= removal of infested shoots, T2= use of light trap, T3= removal of infested shoots+ use of light traps and T4= Control (no management practice). Seeds were sown in earthen pots on March 2018 for nursery growth. Seedlings were transplanted by hand on ridges 1.0 m apart in a plot of 0.202 ha (1/2 acre). The lanterns were hung 139.3 cm high over a metal tray of 36.6 cm and 18.3 cm diameter and depth, respectively. Data was recorded once in a week from twenty randomly selected plants. The study is resulted that cultural and mechanical control or treatments gave best control and reduce the pest infestation. The pest population was highest in control treatment than other three treatments.

Keywords: *Solanum melongena* L., *Leucinodes orbonalis* G., Cultural Practices, Mechanical Practices.

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INTRODUCTION

Brinjal is an important vegetable, cultivated in various countries such as Pakistan, India, Sri Lanka, Bangladesh and Thailand (Kantharajha & Golegaonkar, 2004; Thapa, 2010; & Yousafi et al., 2018). Hot and humid environment is favorable for brinjal production (Hanson et al., 2006). Brinjal belongs to family Solanaceae and Pakistan is the native land of brinjal (Dunlop, 2006). According to FAO (2014), Pakistan produces around 87,000 ton annually from 9,000 ha cultivated area.

Many insect pests such as jassid (*Amrasca bigutulla bigutulla*), whitefly (*Bemisia tabaci*), coccinellid beetle (*Epilachna vigintioctopunctata*) and aphid (*Aphis gossypii*) attach on the brinjal from time of sowing to harvesting (Latif et al., 2009). Among all these insect pests, brinjal shoot and fruit borer (BSFB) (*Leucinodes orbonalis* G.) is one of the major, economically very important pest and threat for brinjal production (Latif et al., 2010; Chakraborti & Sarkar, 2011; Saimandir & Gopal, 2012; & Dutta et al., 2011). BSFB spread throughout the brinjal producing countries such as India, Pakistan, Africa, Bangladesh, Thailand, Sri Lanka, Nepal and Sahara and South-East Asia (CABI, 2007). The larva of BSFB is bore into the tender plant parts of fruit and shoot. It damage the flowers, shoots and fruits. The infestation on flowers is minimum (CABI, 2007; & Alam et al., 2006). The severe attached of BSFB, make fruits unfit for human consumption (Baral et al., 2006). Misra, (2008) and Jagginavar et al. (2009) reported that 80-90 % production reduce due to BSFB.

The different types of insecticides are used on weekly basis by farmers for the management of BSFB and get good quality brinjal production. The excessive use of insecticides directly and indirectly effects human and environment. Directly, insecticides are harmful for human beings and the environment while indirectly pollute the soil and water by leaving residues in fruit (Pértille et al., 2009; & Martínez et al., 2004).

BSFB has been controlled by using various management strategies such as integrated pest management (IPM) approaches (Alam et al., 2006). IPM strategies can reduce the pest population rather than elimination (Islam et al., 2004). The use of insecticides can reduce up to 50% by the adaptation of IPM tactics for the control of insect pests such as BSFB (Mandal et al., 2009). The current study was conducted to check the BSFB infestation as affected by both cultural control (removal of infested brinjal shoots) and mechanical control (use of light traps). The BSFB infestation was study by the combination as well as alone use of cultural control and mechanical control to recommend appropriate and reasonable management approach.

MATERIALS AND METHODS

The study was carried out in Faisalabad on spring sown crop from April 15, 2018 to September 30, 2018. The experiment was arranged into Randomized Complete Block Design (RCBD) with four treatments, each replicated three times. The experiment was design by using the method as described by (Yousafi et al., 2018). The treatments were T1= removal of infested shoots, T2= use of light trap, T3= removal of infested shoots + use of light traps and T4= Control (no management practice). The seeds of brinjal variety, Nirala were obtained from Ayyub Agriculture Research Institute. Seeds were sown in earthen pots on March 2018 for nursery growth. Seedlings were transplanted by hand on ridges 1.0 m apart in a plot of 0.202 ha (1/2 acre). Transplantation was done by hand on March 15, 2018. Transplanting was done on one side of ridges keeping plant to plant distance of 30cm. The replications were treated on three different locations of study area (Faisalabad). To minimized the effect of one treatment to other, distance between them kept 200m.

The light traps were made of a metal lamp with glass chimney. The lanterns were hung 139.3 cm high over a metal tray of 36.6 cm and 18.3 cm diameter and depth, respectively. The tray was filled with water

and kerosene oil in 10: 1 ratio. The lantern was lit daily from dusk to dawn. Two times in a month, 15 April to 15 September, BSFB were collected by sieving the water and kerosene mixture. On the same day of recording data, the infested shoots were removed fortnightly.

The randomly twenty plants were selected from each plot and fruit infestation data was recorded from selected plants. The healthy and infested fruits were counted and %age infestation recorded by using the following formula:

$$\% \text{ age of fruit infestation} = \text{Fruits infested by BSFB} / \text{Total No. of fruits} \times 100$$

Statistical Analysis

Data was statistically analysed. Mean separation and analysis of Variance was done by calculating Least Significant Difference at $p=0.05$ using Statistix (2000) statistical software at $p = 0.05$.

RESULTS AND DISCUSSION

Infestation of brinjal shoot and fruit borer (BSFB) in different treatments was presented in Table 1. During the current study, it was observed that control plots had more BSFB infestation as compared to others two

treatments (Infested Shoot Removal, ISR and ISR+ Light Trap Only, LTO). The infestation in control and light traps plots was non-significantly different in April 15. Our study results were similar with the findings of earlier studies (Yousaf et al., 2018). The infestation of BSFB was higher in the treatment T2 (LTO) as compared to other treatments such as T1 (ISR) and T3 (ISR+LTO). The BSFB infestation was maximum in control (T4) followed by infested shoot removal (T1) and light traps (T2) while minimum in infested shoot removal+ light traps (T3).

Table I. Brinjal fruit infestation percentage in different management practices against BSFB (*Leucinodes orbonalis* G.) at Faisalabad in 2018

Sampling dates	Treatments				LSD*
	ISR (T1)	LTO (T2)	ISR+LTO (T3)	Control (T4)	
15-April	11.52±1.1c	18.36±1.0b	12.36±1.0c	20.99±1.4a	4.58
30-April	10.14±0.5c	17.27±1.0b	9.76±1.0c	22.64±1.0a	3.49
15-May	14.79±0.7b	22.70±1.4a	14.23±0.7c	27.79±2.2a	4.92
30-May	18.66±1.9c	25.85±1.3b	11.63±0.5d	32.36±2.4a	3.60
15-June	19.71±0.9c	21.69±1.2b	12.37±0.5d	30.29±1.2a	3.42
30-June	13.33±0.7c	18.21±1.0b	11.48±1.1c	32.10±1.5a	3.30
15-July	17.84±0.5c	14.96±0.6b	12.34±0.7c	29.10±1.1a	2.90
30-July	11.31±1.1c	22.67±1.5b	6.95±0.6c	31.45±1.7a	4.86
15-August	13.34±2.3b	21.24±0.7b	10.57±1.1c	33.32±2.3a	4.66
30-August	12.76±0.7c	25.32±0.7b	11.43±0.4c	35.98±0.8a	2.48
15-September	17.84±0.5c	21.67±1.5b	18.21±1.0b	32.37±1.7a	4.86
30-September	10.19±1.0c	21.67±1.5b	7.75±0.6c	32.37±1.7a	3.99
Mean**	14.10±0.5c	20.71±0.2b	10.8±0.2d	30.34±1.0a	1.84

Note. *, Means followed by same letter in rows are non-significantly different (LSD; $P=0.05$). **, Sum of infestation on all sampling dates / number of sampling dates

On 15 and 30 April infestation level of brinjal shoot and fruit borer was lower than other sampling dates in the same treatment. On 30-July and 15-September, lowest and highest infestation was recorded in infested shoot removal + light traps treatment (T3). During

September, infestation was maximum as compared to other sampling dates or months. The current study showed that seasonal infestation was different in all treatments. The similar findings had been observed by Yousaf et al. (2018). Physical, mechanical, cultural,

botanical, entomopathogens and chemical etc. are the components of integrated pest management (IPM) of brinjal shoot and fruit borer. IPM approaches have been applied against various insect pests throughout the globe (Islam et al., 2004).

Among all these approaches, chemical control has reduced the pest population but has some residual effect on environment as well as human body (Islam et al., 1999; Patnaik & Singh, 1997; Prabhat, & Johnsen, 2000; & Bajpai et al., 2005). All management tactics were proved fruitful for pest management and gave better control. In the current study, removal of infested shoots+ use of light traps was reduced the fruit infestation. The combination of these management strategies kept the infestation close to the economic injury level i.e., 10 percent fruit infestation as described by Department of Agriculture, Government of the Punjab (PW & QCP, 2014).

The cultural practices include sowing date, irrigation, clean cultivation, removal of alternate food sources (hosts), destruction of crop residues, crop rotation, shifting of planting or harvesting time, use of organic and balanced fertilizers etc. (Murthy & Nandihalli, 2003; & Reddy & Kumar, 2004). All these have been used against BSFB management all over the world (Karim, 1994). Cultural practices make food less favorable and disturb the reproductive cycle of BSFB.

The cultural practices such as removal of infested shoots can be adopted by each farmer at farm level. The area wide management of both practices such as cultural and mechanical can reduce the pest infestation. Both practices are affordable and inexpensive for farmers. Both strategies can prove best control against BSFB, applied with other integrated management tactics such as insecticides (Awal et al., 2017), pheromones and resistant varieties. The pest infestation can decrease by adopting all above-mentioned strategies such as cultural, mechanical, resistant varieties, use of chemical and pheromones. The combining use of pheromones and removal of infested shoots

can reduce the BSFB infestation (Srinivasan, 2008). The light traps were used for the attraction of lepidopteran insect pests like BSFB. The similar findings were reported by Intachat and Woiwod (1999).

The quality, quantity, size, weight and diameter of fruit was improved through the proper application of cultural practices (removal of infested shoot+ use of light traps. The yield losses can be reduced by the application of IPM strategies such as botanical and biological (Rahman et al., 2009; Mandal et al., 2009; Dutta et al., 2011; & Sasikala et al., 1999). During off-season, clipping, pruning and thinning of infested shoots were best management approaches in reducing the brinjal shoot and fruit borer (BSFB) infestation (Neupane, 2000; & Ghimire, 2001).

A study was conducted by Cork et al. (2005), reported that mass trapping was reduced the BSFB infestation. The size and shape of trap were helpful in reduction of pests population (Cork et al., 2005). The use of eco-friendly insecticides with physical and mechanical control is the best option for reduction of BSFB infestation (Onekutu et al., 2014). The application of chemical such as Tracer-45 SC Bactoil and Proclaim-5 SG in summer and winter achieved the higher healthy fruit yield as well as total fruit yield of brinjal (Awal et al., 2014) and safer for natural enemies (Awal, et al., 2015) while Nimbecidene was the least effective insecticide in controlling the BSFB (Jat & Preek, 2001 & Misra, 1993). Another study was demonstrated that spinosad and emamectin benzoate most effective against BSFB infestation (Yousafi et al., 2015; & Khan & Naveed, 2017).

CONCLUSION

Brinjal fruit borer, *Leucinodes orbonalis* G is the key pest of eggplant, distributed throughout the tropical and sub-tropical regions of the world including Pakistan. The short life cycle and boring nature of the pest made it worst in the study area. Many control methods have been suggested by researchers to control the pest infestation. The chemical control was used excessively against BSFB

infestation and caused environmental and health problems. The pest population can be reduced by mechanical and cultural practices such as pruning, thinning, intercropping, removal of infested shoots and alternate hosts, adopting net barriers and use of light traps. The resistance varieties should be promoted and which proved to be fruitful for pest (BSFB) management. The mass trapping can be reduced the pest infestation.

Authors Contribution

MR and GM conducted the study while MR conceived the manuscript.

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