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STUDY ON THE POPULATION TREND OF BRINJAL FRUIT BORER *Leucinodes orbonalis* GUEN. (LEPIDOPTERA: PYRALIDAE) AND IT'S SUSCEPTIBILITY TO DIFFERENT INSECTICIDES

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ABSTRACT

Brinjal fruit borer, *Leucinodes orbonalis* Guen. is the major insect pest of brinjal (eggplant) in South Asia. Larvae bore into the fruit; render it unfit for human consumption. This study reports the seasonal fluctuations and the efficacy of various insecticides against *L. orbonalis* in a field study conducted in two separate plots under field conditions. To determine the seasonal abundance and population trend of the pest, plants were regularly monitored on weekly basis throughout the cropping season soon after the fruits were formed. *L. orbonalis* was most persistent throughout the crop growing season. A low infestation (18.66%) of borer was noted in the third week of May, severe infestation (75.50%) in the first week of August, and a high infestation (42.64%) in the last week of September at the end of the crop growing season. Five insecticides from different classes of chemicals were sprayed 3 times at 25 days interval against the borer, which significantly reduced the borer infestation in comparison to the untreated control. However, Ripcord (Cypermethrin) decreased the infestation to a least minimum level than any other insecticide used.

Keywords: brinjal, *leucinodes orbonalis*, population trend, insecticides, ripcord, confidor, lorsban, thiodan, tamaron

INTRODUCTION

Brinjal (*Solanum melongena* L.) also known as eggplant, aubergine or Guinea squash, ranks seventh among vegetable crops in terms of production worldwide (FAOSTAT, 2103). The crop is native to South Asia and has been cultivated for long time. It is a warm season crop and thrives best in areas where day temperature ranges from 80 °F to 90 °F, and night temperature from 70 °F to 80 °F. (Thompson and Kelly, 1957). It is of considerably economic importance in Asia, Africa and Subtropics (Pakistan, India, Central America) but is also grown in some warm temperate regions (Mediterranean area, South of the USA) (Sihachakr *et al*., 1993). It is an important nourishing summer vegetable and its fresh weight is composed of 92.7% moisture, 1.4% protein, 1.3% fiber, 0.3% fat, 0.3% minerals with a good source of Manganese, and the remaining 4% consists of various carbohydrates and vitamins (A and C) (Khan, 1979). Brinjal is mainly used in various cuisines in Pakistan and elsewhere. Besides, the hypolipidemic effect due to the presence of flavonides which results in degradation of cholesterol level makes this vegetable medicinally important (Sudesh. *et al*., 1997).

In Pakistan, area under this crop was 9044 hectares and the total production was 91126 tonnes with an average yield of 10075.9 Kg ha^{-1}. (FAOSTAT, 2013). The crop seedlings are normally transplanted in March–April and remain on fruiting till October. Due to the long cropping season the crop is exposed to the attack of a large number of pests, which inflict considerable losses in crop vigor, quality and yield.

All stages of eggplant are attacked by *L. orbonalis* Guen which is regarded as one of its major insect pests (Purohit and Khatri, 1973; Kuppuswamy and Balasubramanian, 1980; Allam *et al*. 1982). Larvae bore into the tender shoots of both seedlings and after transplantation older plants, causing wilting and death of the growing tips. Later, they bore into flower buds and fruits (Atwal, 1976). The damaged buds are shed and the fruits carry circular holes, sometimes plugged with frass. Such fruits are unmarketable. The yield loss varies with location and season and is greatest when temperature and humidity are high. Losses range from 20 to 60% (Roy and Pande 1994; Dhamdhere, et al. 1995; Haseeb *et al*. 2009) or even higher (Akhtar and Khawaja, 1973; Lal, 1991; Saeed and Khan, 1997, present study). It has also been reported that Vitamin C in bored fruit can be reduced by 60% (Hami, 1955). The insect has attained the category of a severe pest for brinjal and has been declared as a quarantine pest in most of the European countries (EPPO, 2015).

Although, alternative control measures are being sought (Dwivedi *et al*. 2014), but realizing the intensity of the damage *L. orbonalis* causes, application of chemicals becomes inevitable and is still the primary choice for most of the eggplant-growing farmers. We have reported here in our study the seasonal fluctuation, the population density, and thereafter the use of various groups of chemical insecticides for the control of this obnoxious pest. This study screens out the best insecticide against *L. orbonalis* among the four groups tested.

MATERIALS AND METHODS

Seedling collection

Seedlings were collected from farmer's field and transplanted to experimental plots located at Agricultural Research Institute (ARI) Tarnab Peshawar in March. Plant to plant and row to row distance was kept 0.4m and 1.4m respectively. Research project was consisting of the following two experiments.

Population density

For recording seasonal abundance of brinjal fruit borer, an experiment was designed on an area of 10.5 × 18m, and replicated three times. After transplantation of seedlings, brinjal crop was regularly monitored on weekly basis to record densities of brinjal fruit borer. For the purpose, sound and damaged fruits were counted on each picking and percent infestation was determined.

Chemical control

To grade the efficacy of five different insecticides against *L. orbonalis*, an experiment was laid out in a Randomized Complete Block (RCB) Design. The experiment was comprised of 6 treatments (3.5 × 6m each) including a control. Each treatment was replicated three times. Details of the treatments were as under.

Trade name	**Common name**	**Chemical group**	**Dose** (ml/lit water)
T1 = Lorsban 40 EC	Chlorpyrifos	Organophosphate	2
T2 = Thiodan 35 EC	Endosulphan	Cyclodiene	2
T3 = Tamaron 600 SL	Methamidophos	Organophosphate	1.5
T4 = Confidor SL 20	Imidacloprid	Neonicotinoids	0.5
T5= Ripcord 100 g/l EC	Cypermethrin	Pyrethroid	2
T6 = (Control)			

These insecticides were sprayed three times in the whole cropping season at 25 days interval with the help of knap sack sprayer. First spray was carried out on May 30, followed by second and third spray on June 25, and July 20 respectively. Control received water only. Observations were recorded one day before and at weekly interval after each spray. Borer infestation was determined by counting each sound and infested fruit on all pickings. Figures have been presented in percentage.

Statistical analysis

The data recorded for each trait were individually subjected to ANOVA using MSTATC software, and means were separated by using LSD test (Steel and Torrie, 1980).

RESULTS AND DISCUSSIONS

Population density

An initial 18.66 % infestation of *L. orbonalis* was first noticed in the third week of May which augmented gradually with certain incremental rates. The peak infestation of 75.50% was noted in the first week of August. Immediately after the first week of August, infestation was dropped to 60.30% in the next week. Thereafter it went on declining until the end of September. However, the pest occurred more consistently and an infestation level of 42.64% was recorded on the last picking (Figure-1). The months of July-August are quite hot and humid in Peshawar valley which is the preferred environment for this pest and therefore, the infestation was quite high during this time. Moreover, the fruits are too juicy and succulent during this part of the cropping season and plenty of food is available to the insect. When the plants get old, the fruit size decreases and are not as succulent as before which might account for their low infestation (Saeed and Khan (1997). *L. orbonalis* has been reported by various studies in diverse locations as the destructive pest of eggplant at various infestation levels, such as Roy and Pande (1994), Dhamdhere *et al.* (1995), Suresh *et al.* (1996), Bhadauria *et al.* (1999), and Singh *et al.* (2000).

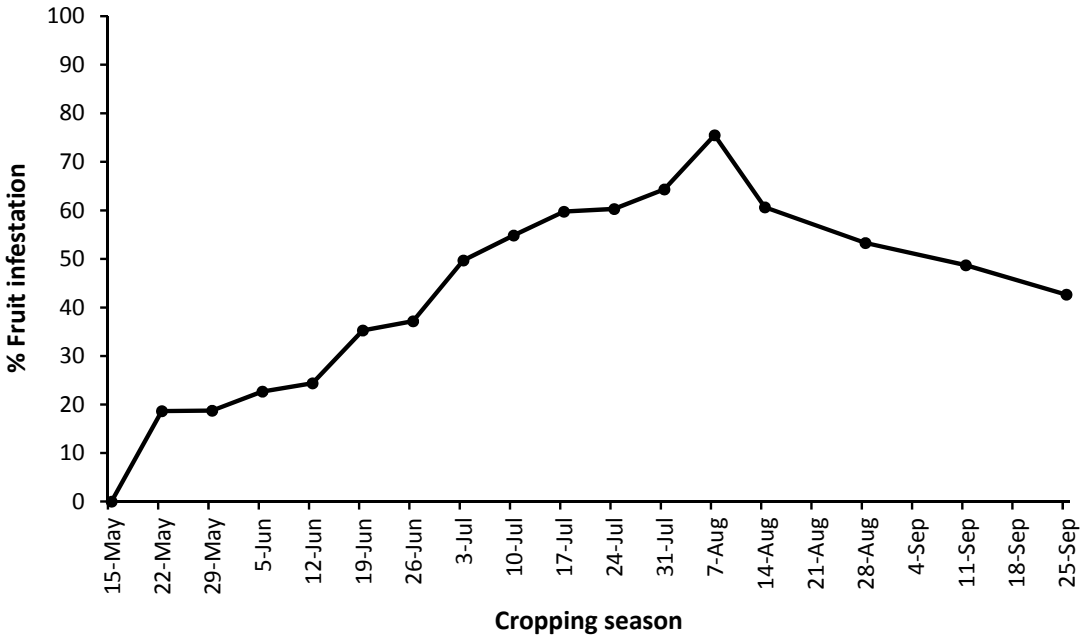

Figure- 1. Percent fruit borer infestation throughout the cropping season.

Chemical control

Mean percent infestation by brinjal fruit borer after 3 sprays has been given in Figure-2. All insecticides decreased the infestation more efficiently up to 3 weeks post-spray application. Infestation level in all the treatments was significantly lower than that of the control ($P<0.05$). Lowest infestation was recorded in first week; thereafter the infestation increased in the second and third week. Ripcord was significantly better than all insecticides which reduced the borer infestation to the lowest level (16.04-11.44%) after all the three sprays. It was followed by Tamaron (9.23-18.29%), Lorsban (9.34-18.59%), and Confidor (12.37-28.23%), whereas Thiodan showed a fair level of effectiveness but infestation (15.96-33. 06%) was still significantly lower ($P<0.05$) than the control (25.95-74.77%). Lorsban and Tamaron, did not differ significantly ($P>0.05$) from each other in terms of borer infestation. Ripcord (Cypermethrin) is a contact poison and the insect comes in contact with it when coming out of one fruit and enters another. This is most probably the reason why contact poison works well against this borer. Since most of the times the insect is inside the fruit or shoot and dose not feed outside, therefore stomach poison might not work that efficiently. Misra (1993) evaluated the chemical control of *L. orbonalis* on brinjal and reported that cypermethrin @ 0.5 kg a.i.ha^{-1} at 15-day intervals was the most suitable insecticide for the control of *L. orbonalis*. During another study, Mohan and Prasad (1984) noted that cypermethrin was the most effective insecticide in reducing the infestation by borer. Our results about the reviewed products have similar tendency too.

Since the residual effect of cypermethrin lasts for sometimes, therefore, spray application is usually repeated three times after 15 -30 days gap (Chowdhury *et al*. 1993). This study finds a 25 days spray interval promising, however, in case of severe infestation a fortnight spray is advisable.

One interesting observation in our study we noted was that cypermethrin application increased the incidence of two-spotted spider mites. This is probably due to the killing of its biological control agents with pyrethroids. Previous studies have also shown that applying synthetic pyrethroids for the control of *L. orbonalis* on eggplant significantly increases the incidence of mites (Kuppuswamy and Balasubramanian, 1980).

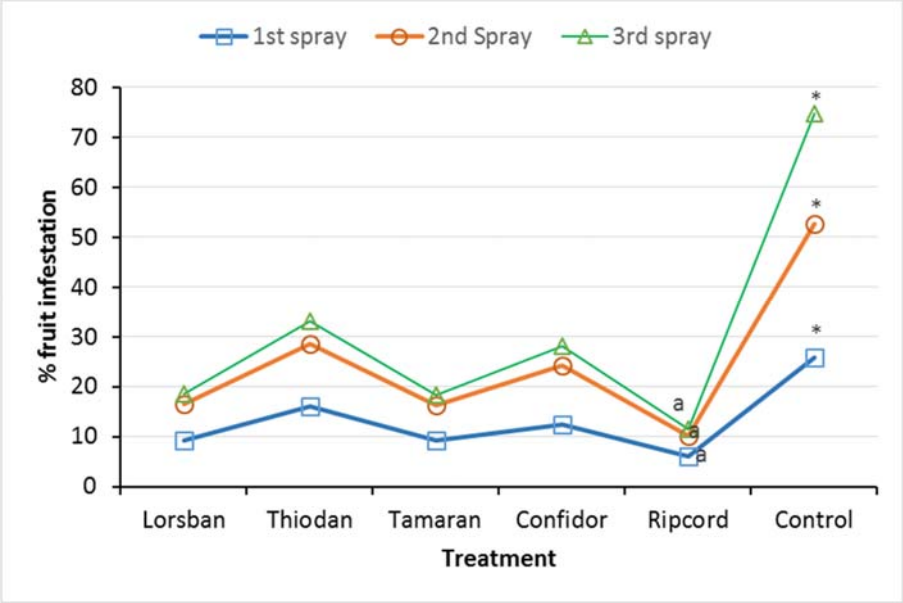

Figure-2. Percent infestation of *L. orbonalis* after the application of insecticides. Asterisks above the control indicate that all the insecticides are significantly better than control in lowering infestation. The small letter 'a' indicates that Ripcord is significantly different than all other treatments.

CONCLUSIONS

Brinjal fruit borer, *L. orbonalis* Guenee is a major pest, causes severe damage to brinjal crop. The insect remains more or less consistent since anthesis until harvesting of the last fruits. Based on the research conducted, we hereby recommend a spray application of 3-4 times of cypermethrin at fortnight interval starting at flower formation time for managing this obnoxious pest. However, with the application of pyrethroids the outbreak of mite does occur, therefore a pyrethroid insecticide should be supplemented with a miticide if there is appearance of mites.

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