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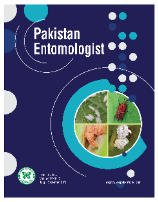

EFFICACY OF NEW CHEMISTRY INSECTICIDES AGAINST BRINJAL SHOOT AND FRUIT BORER (*LEUCINODES ORBONALIS* GUENEE)

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ABSTRACT

Brinjal is one of the important vegetable of world. It is smooth shiny skinned deep purple fruit and considered as staple vegetable. It accumulates vitamin A & D and minerals like calcium, phosphorus, potassium, sulphur, iron, iodine and copper. Brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) is one of major chewing insect pest of brinjal and its infestation cause severe losses to this crop. In Pakistan farmers mostly rely on the chemicals to control pests. In the present study the efficacy of some new chemistry insecticides was evaluated against brinjal shoot and fruit borer. The experiment was conducted by using fruit dip method against 1st instar larvae. The results revealed that flubendamide was most effective insecticide among all the tested insecticide with 87% mortality after 72 h of application while imidacloprid was the least effective. The finding of this research provides useful information regarding better management of BFSB in the field.

Keywords: Brinjal shoot and fruit borer, Efficacy, new chemistry insecticide

INTRODUCTION

Brinjal, (*Solanum melongena* L.) also known as eggplant belonging to the family "Solanaceae", is one of the common and popular vegetables grown throughout the world that accounts for almost 50% of the world's area under its cultivation (Alam *et al*., 2003). The family contains more than 2450 species distributed in 95 genera (Mabberley, 2008) It contains important minerals like iron, phosphorous, calcium and vitamins like A, B and C. It is also used as a raw material in pickle making (Singh *et al.,* 1963). Eggplant is one of the most important vegetables in South and South-East Asia (Javed *et al.*, 2017). In Pakistan it is cultivated over 9,000 ha and production is 87,000 tons per annum (FAO, 2014).

Brinjal shoot and fruit borer, BFSB, (*Leucinodes orbonalis* Guenee), (Lepidoptera: Pyrallidae) is the most serious chewing pest of brinjal crop and it damages the fruits upto 50-70% (Saeed and Khan, 1997). It damages shoot and fruit of brinjal plant in almost all stages of growth. Serious damage is caused by the larval stage of this pest. Brinjal larvae bore the plant shoot and fruits which directly affect growth, yield and fruit quality of crop and thus make it unfit for feeding purpose. It also bore in later stages of the plant and its feeding pattern on plant tissues makes zigzag channels (Harish *et al*., 2011). This pest causes 31-86% fruit damage in Bangladesh (Alam *et al.,* 2003) which may reach up to 90%. The insect remains active throughout the year except few winter months. Due to its high production, various generations and cultivation of aubergine in different seasons, the pest poses a serious threat. The newly hatching larvae bore the petioles, midribs of the leaves and fresh shoots. Later, the larvae enter in flower buds and fruits. The entry place of the larvae is closed by their excreta and feed internally (Latif *et al*., 2010). A single larva of *L. orbonalis* is enough to damage 4-6 healthy fruits (Kumar *et al*., 2012). Translocation mechanism of nutrients in shoot is also affected due to the larval activity (Alam *et al*., 1997).

Application of different insecticides reduced the fruit damage (Patnaik *et al*., 1998). Insecticides had been effective against this pest and most of Asian farmers rely on the use of chemicals (Kumar *et al.,* 2006). Pesticide usage survey was conducted in Bangladesh which indicated that farmers treated the field 180 times using different chemical insecticides during a year in order to protect brinjal crop against BSFB (SUSVEG Asia, 2007). Insecticides are considered to be the rapid method for the control of insect pests to overcome losses. Insecticides are always in ready form, easily accessible and a wide range of insecticides are available in the market for the control of insect pest. The aim of the present

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study was to evaluate the efficacy of some new chemistry insecticides against BFSB for better control.

MATERIALS AND METHODS

Collection and rearing of brinjal shoot and fruit borer (BSFB)

Brinjal shoot and fruit borer (BSFB) was collected from the fields of Rawalpindi district and reared in the Toxicological laboratory, Department of Entomology, PMAS-AAUR. The collected larvae were kept in plastic jars with brinjal fruit as diet. The jars were kept in laboratory for rearing at 25±2°C, and 60±5% RH with light and dark periods 16:8 hours. Larvae were fed with natural diet (Brinjal fruit) as well artificial diet for mass rearing in laboratory. Adults were kept in separate jars for egg laying. Adults were fed with 10% honey solution with cotton boll soaked in solution.

Insecticides

Five different insecticides, Abamectin ® 1.8EC, (Abamectin), Bayer crops science, Pakistan, Alsystin® 480SC, (Triflumuron), Bayer crop science, Pakistan, Match®, 50 EC (Lufenuron), Syngenta, Pakistan, Belt® 48SC, (Flubendiamide), Bayer crop science, Pakistan, Confidor® 20SL, (Imidacloprid 200), Bayer crop science, Pakistan, were used in this study.

Toxicity bioassay

Fruit dip method was used to evaluate the effectiveness of the new chemistry insecticides. Fresh solutions of the insecticides were prepared in the distilled water. Fresh brinjal fruits were collected from the field and were cut into 5 cm leaf discs. Brinjal discs were dipped in test solution for 10 seconds and were dried at room temperature for half hour. Brinjal were placed in individual Petri dish (5 cm diameter) with a moistened filter paper. Five larvae from the culture were placed on each disc. Treatments were replicated 3 times. The mortality data were collected after 24, 48 and 72 hrs. For control discs were dipped in distilled water only.

Data analysis

The data regarding mortality were corrected by using Abott's formula (Abbott, 1925).

RESULTS

Toxicity of flubendamide

The results indicated that at higher concentration, the percent corrected mortality was 57.14% after 24 h and the mortality was 21.78% at lowest concentration (500 ppm). The percent corrected mortality was 38.87% after 48 h at 500 ppm. It showed the highest percent corrected mortality of 85.01% after 72 h of application (Table 1).

Toxicity of lufenuron

The results indicated that at higher concentration 2000 (ppm), the percent corrected mortality was 40, 67 and 80% after 24, 48 and 72 hrs of application respectively (Table 2). The mortality 40, 53 and 73% was observed at 1000 ppm after 24, 48 and 72hrs of application respectively. The concentration of 500 ppm showed 27, 33 and 47% corrected mortality after 24, 48 and 72 h of application respectively (Table 2).

Toxicity of imidacloprid

The corrected mortality was 53, 60 and 66.67% at field dose after 24, 48 and 72 h of application respectively (Table 3). At 62.5 ppm it was least effective with percent corrected mortality of 27% after 24 hrs, 40% after 48 hrs and 47% after 72 hrs of application respectively (Table 3). The concentration of 125 ppmrs showed the moderate mortality with 33, 53 and 53% reduction of insect population after 24, 48 and 72 h of application respectively (Table 4.3).

Toxicity of abamectin

The results indicated that at highest concentration the corrected mortality was 40% after 24 h, 57.4% after 48 h and 83.93% after 72 h of application respectively. When the half concentration of field dose applied, it showed mortality of 33, 49.64 and 64.64% after 24, 48 and 72 h of application respectively (Table 4). When the larvae were treated with lowest concentration 31.25 (ppm) the mortality of 20, 35.71 and 35.71% was observed after 24, 48 and 72 h of application respectively (Table 4).

Toxicity of triflumuron

The result indicated that 125 ppm was less effective than 250 ppm and showed the mortality of 21.43, 35.71 and 42.86% after 24, 48 and 72 hrs of application (Table 5). The concentration of 62.5 ppm showed 14.28, 21.43 and 28.56% corrected mortality after 24, 48 and 72 hrs of application respectively (Table 5). These results clearly showed the dose dependent and time dependent pattern.

DISCUSSION

Brinjal is one of the common and popular vegetables grown throughout the world (Alam *et al*., 2003). The cultivation of brinjal in the subcontinent is from ancient times and is almost available in the market throughout the year. Damage caused by insects is the major reason for crop failure. Chemical control is important for insect pest management. Determination of effective dose of insecticide is important factor for insect control. Synthetic insecticides are the most common insecticide used to control this pest. Farmers are familiar with the rapid action of these insecticides.

In the present study, five different chemical insecticides were applied against brinjal fruit and shoot borer. The results showed that flubendamide was most effective insecticide among all the tested insecticides These results were in confirmatory with Latif *et al.* (2010) who reported that flubendamide was the most effective insecticides among all other insecticides i.e bifenthrin, deltamethrin, chlorfluazuron and emamectin benzoate. A combination of flubendamide with bifenthrin and dltamethrin was also very effective against second instar larvae of *H. armigera*. The current results showed more than 85% mortality after 72 hrs of flubendamide application and similar findings were also discussed that flubendamide showed 80, 98, 80 and 100% control against fall armyworm, corn borer, bollworm of cotton and *Spodoptera* species respectively. Many researchers reported the efficacy of flubendamide (Meena *et al.,* 2006). Flubendamide provided 86.80% and 87.80%

control of tomato fruit borer compared with control in year of 2010 and 2011 respectively (Ghosal *et al.,* 2012).

Current results showed that the abamectin was moderately effective against brinjal fruit and shoot borer. Application of abamactin @ field dose against brinjal fruit and shoot borer showed the mortality of 46.66 and 66.67% after 48 and 72 hours of application. Similarly the efficacy of abamectin was tested against *Helicoverpa armigera* and results showed that abamectin reduced the pest population to the moderate level (Vojoudi *et al.,* 2011). Venkateswari *et al.* (2008) reported the LC_{50} value of abamectin 13.9 ppm/100ml and explain it as moderate. In the present study, imidachloprid was less effective to control of brinjal fruit and shoot borer. This is also supported by several research workers and suggested that this is effective to control BSFB infestation. . The sequence of effectiveness among all insecticides was flubendamide > abamectin > lufenuron > triflumuron > imidacloprid respectively. It was concluded that all the insecticides showed more than 50% mortality of BSFB. This might be due to the reason that insect did not develop resistance against new chemistry insecticides.

Table 1

Percent corrected mortality of brinjal shoot and fruit borer 1st instar larvae treated with Flubendamide at different time intervals.

Concentration (ppm)	After 24 hours	After 48 hours	After 72 hours
2000	57.14	84.55	85.01
1000	35.71	60.78	82.69
500	21.78	38.87	53.86

Table 2

Percent corrected mortality of brinjal shoot and fruit borer 1st instar larvae treated with Lufenron at different time intervals.

Concentration (ppm)	After 24 hours	After 48 hours	After 72 hours
250	53	60	66.67
125	33	53	53
62.5	27	40	47

Table 3

Percent corrected mortality of brinjal shoot and fruit borer 1st instar larvae treated with Imidacloprid at different time intervals.

Concentration (ppm)	After 24 hours	After 24 hours	After 24 hours
2000	40	67	80
1000	40	53	73
500	27	33	47

Table 4

Percent corrected mortality of brinjal shoot and fruit borer 1st instar larvae treated with Abamectin at different time intervals.

Concentration (ppm)	After 24 hours	After 48 hours	After 72 hours
125	40	57.14	83.93
62.5	33	49.64	64.64
31.25	20	35.71	35.71

Table 5
Percent corrected mortality of brinjal shoot and fruit borer 1st instar larvae treated with Triflumuron at different time intervals

Concentration (ppm)	After 24 hours	After 48 hours	After 72 hours
250	21.43	42.86	64.29
125	21.43	35.71	42.86
62.5	14.28	21.43	28.56

AUTHORS' CONTRIBUTION

Asim Gulzar, Munir Ahmed and Tariq Mukhtar conceived the idea. Fasi-Ur Rehman conducted the experiment. Asim Gulzar and Muhammad Ali conducted the data analysis. Asim Gulzar and Fasi-Ur Rehman wrote the paper.

REFERENCES

Alam, S.N., M.A. Rashid, F.M.A. Rouf, R.C. Jhala, J.R. Patel, S. Satpathy, T.M. Shivalingaswamy, S. Rai, I. Wahundeniya, A. Cork, C. Ammaranan, and N.S. Talekar, 2003. Development of an integrated pest management strategy for eggplant fruit and shoot borer in South Asia. Shanhua, Taiwan: AVRDC-the World Vegetable Center. Technical Bulletin No. 28. AVRDC Publication No. 03: 548-556.

Alam, S.N., M.A. Rashid, F.M.A. Rouf, R.C. Jhala, M.G. Patel, L.K. Nath, A. Sengupta, K. Baral, A.N. Shylesha, S. Satpathy, T.M. Shivalingaswamy, A. Cork and N.S. Rahman, 1997. Screening of 28 brinjal line for resistance tolerance against the brinjal shoot and fruit borer. Annual Report. Entomology Division, Bangladesh Agric. Res. Ins., Joydebhpur, Ghazipur. Bangladesh. pp. 32-35.

FAO, 2014. FAOSTAT. (Available at: http://www.fao.org).

Ghosal, A., M.L. Chatterjee and D. Manna, 2012. Studies on some insecticides with novel mode of action for the management of tomato fruit borer (*Helicoverpa armigera* Hub.). Journal of Crop and Weed, 8:126-129.

Harish, D.K., A.K. Agasimani, S.J. Imamsaheb and S.S. Patil. 2011. Growth and yield parameters in brinjal as influenced by organic nutrient management and plant protection conditions. Journal of Agricultural Science Research, 2: 221-225.

Javed, H., T. Mukhtar, K. Javed and A. Mohsin, 2017. Management of eggplant shoot and fruit borer (*Leucinodes orbonalis* Guenee) by integrating different non-chemical approaches. Pakistan Journal of Agricultural Sciences, 54: 65-70.

Kumar, N.K., K.B. Kumari, S.H. Singh, B. Shivkumara, H.R. Ranganath and C.M. Kalleshwaraswamy, 2006. Pheromone trapping protocols for eggplant fruit and shoot borer, L. *orbonalis* Guen. evaluation of trap design, quantity and dispenser. Journal of Horticultural Sciences, 1: 39-42.

Kumar, S.D., H. Masarrat and Q. Muntaha, 2012. Comparative potential of different botanicals and synthetic insecticides and their economics against *Leucinodes Orbonalis* in Eggplant. Journal of Plant Protection Research, 52: 35-39.

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

Mabberley, D.J., 2008. Mabberley's Plant-Book.Cambridge University Press.

Mathur, A. and N. Jain, 2006. Control of shoot and fruit borer of brinjal, *Leucinodes orbonalis* (Lepidoptera: Pyralidae) in brinjal. Trends in Biosciences, 2: 68-69.

Meena, R.S., C.P. Srivastava and N. Joshi, 2006. Bio-efficacy of some newer insecticides against the major insect pests of short duration pigeon pea. Pestology, 30: 13-16.

Puranik, T.R., A.B. Hadapad, G.N. Salunkhe and D.S. Pokharakar, 2002. Management of shoot and fruit borer, *Leucinodes orbonalis* (Guenee.) through *Bacillus thuringiensis* formulations on brinjal. Journal of Entomological Research (New Delhi), 26: 229-232.

Rahman, M.M. and M. Islam, 2004. Evaluation of IPM packages on the basis of infestation level. World Journal of Zoology, 4: 166-168.

Saeed, M.Q. and I.A. Khan,1997. Population abundance and chemical control of brinjal fruit borer *Leucinodes orbonalis* Guenee (Lepidoptera: Pyralidae). Sarhad Journal of Agriculture, 13: 399-402.

Singh, S., S. Krishna Kumar and S.L. Katyal, 1963. Fruit culture in India. Indian Council of Agricultural Research. New Delhi, pp. 412-415.

Susveg-Asia, 2007. SUSVEG-Asia Brinjal integrated pest management (IPM). http://susveg-asia.nri.org/susvegasiabrinjalipm4.html (Accessed on 19 September 2007).

Venkateswari, S., P.V. Krishnayya, P.A. Rao and K.V.M.K. Krishnamurthy, 2008. Bio-efficacy of abamectin and emamectin benzoate against *Spodoptera litura.* Journal of Pesticide Research, 20: 229-233.

Vojoudi, S., M. Saber, H.J. Mir and T.H. Reza, 2011. Toxicity of chlorpyrifos, spinosad and abamectin on cotton bollworm, *Helicoverpa armigera* and their sublethal effects on fecundity and longevity. Bulletin of Insectology, 64 : 189-193.