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Assessment of Different Bio-pesticides for Management of Fruit Borer in Tomato (*Lycopersicon esculantum* L.)

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A B S T R A C T

Tomato (*Lycopersicon esculentum*) is the world's second important vegetable crop known as protective food because of its special nutritive value and widespread production An experiment was conducted to Assessment of different Bio-pesticides for management of fruit borer in Tomato(*Lycopersicon esculantum L.)***.** The on farm trial were carried out in farmers field of 05 different location of Bhagwanpur hat Block of Siwan district, Krishi Vigyan Kendra, Siwan (Dr.Rajendra Prasad Central Agricultural University Pusa, Samastipur), Bihar, during the time period from November, 2015 to March, 2016. The cost ratio of was also calculated, it ranged from technological option I- Spraying of cypermethin 10EC, III--NSKE 4% with sticker and II Bt formulation @ 500gm.per ha. at 10 days interval was higher than the farmer practices .Thus, and it was clearly showed that the technological option. I- HaNPV 250LE with jaggery 10 gm./litre of water, technological option. III-NSKE 4% with sticker and technological option. I- Bt formulation @ 500gm.per ha. at 10 days interval was better than farmer's practices.

Introduction

Tomato (*Lycopersicon esculentum*) is the world's second important vegetable crop known as protective food because of its special nutritive value and widespread production. In India nearly 7.1 million tonnes of tomato is produced annually, ranking it fifth in the world, from an area of 5.4 lakh ha, placing the country at the second position globally based on its area of production (Arora *et al.,* 2012). This crop is severely attacked by various insect pests viz., fruit borer, *H. armigera* (Hub.); whitefly, *Bemisia tabaci* (Gennadius); aphid, *Aphis gossypii* (Glover); leaf eating caterpillar, *Spodoptera litura* (Fabricius); *American serpentine* leaf miner, *Liriomyza trifolii* (Burgess) and red spider mite (*Tetranychus urticae*) Ignacimuthu, S. (2007). Among these, fruit borer, *H. armigera* is an important pest responsible for major yield loss in tomato. *H. armigera* has attained the status of national pest in recent years in the form of economic damage caused to different agricultural crops throughout India. Number of synthetic organophosphate insecticides has been recommended for its effective control from

different parts of country Mote *et al.*, (1975). The safe and effective pesticides should be recommended for control of this pest. With this objective now a day's bio- pesticides have been recognized in biological approach of pest management. To control the borer, many preventive measures have been reported across the world. Among these, chemical insecticides can be used for effective control but they have extreme adverse effects on environment and consumers. Moreover, continuous use of chemical insecticides develops cross and multiple resistant strains in many important insect species (Geiger *et al.*, 2010) including this fruit borer. However, to avoid the hazardous effect on ecology and ultimate consumers, now-a- days different time demanded eco-friendly control. Therefore the experiment was undertaken aiming to control the tomato fruit borer (TFB) infestation through biopesticides in ecological safe way and simultaneously to evaluate the best performing management practice among the used ones.

Materials and Methods

The on farm trial were carried out in farmers field of 05 different location of Bhagwanpur hat Block of Siwan district, Krishi Vigyan Kendra, (Dr.Rajendra Prasad Central Agricultural University Pusa, Samastipur), Bihar, during the time period from November, 2015 to March, 2016 to record the reliable data in order for assessing the comparative performance of eco-friendly management tools against Tomato Fruit Borer (TFB) infestation in ex situ condition.

The technological option as were fallows-

F.P-Spraying of cypermethin 10EC

T.O.I- HaNPV 250LE with jaggery 10 gm./litre of water

T.O.II- Bt formulation@500gm.per ha. at 10 days interval.

T.O.III-NSKE 4% with sticker

The experiment was RBD design with five replications and four technological options including farmers practice. The size of a unit plot was 20.00m × 10.00m. Distance of 1.00 m between blocks and 0.5 m between the plots was maintained to facilitate different intercultural operations.

Data collection parameters

The data on percentage infestation of tomato fruits by borer was calculated at each picking by counting damage and healthy fruits in each spray application. The mean per cent fruit damage was calculated using formula**:**

$$\text{Mean fruits damage (\%)} = \frac{\text{Number of infested fruits(IF)}}{\text{Total of Number fruits (TF)}} \times 100$$

Total Number of infested fruit

The infested fruits were collected from each tomato plant during different fruiting stage (early, mid and late stage) and thereafter, number of infested fruit was counted visually.

Total No. of Infested fruits/plant = Total no. of fruits in plant - number of infested fruit

Number of larvae (borer) per fruit

Firstly the infested fruits were collected from each plot. Secondly number of larvae per infested fruit was visually estimated through dissection and finally their average value was estimated by the formula as follows:

$$\text{Mean number of borer per fruit} = \frac{\text{Total no. of borers per fruit}}{\text{Total numbers of infested fruits plot}}$$

$$\text{Insect /Pest incidence (\%)} = \frac{\text{Total number of infected plant}}{\text{Total number of plant assessed}} \times 100$$

(Berger-1980)

Data analysis

The recorded data were analyzed statistically for ANOVA (Analysis of Variance) with the help of computer package program MSTAT-C where the mean differences were adjudged by Duncan's New Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

Results and Discussion

Assessment of different Bio-pesticides for management of fruit borer in Tomato (*Lycopersicon esculantum* L.) recorded at different intervals after first, second and third spray The results showed that all the technological options recorded significantly lowest larval population over control (Table 1). Larval population of *H. armigera* was significantly lower in all the treated plots over control. From the result of spray, by HaNPV 250LE with jaggery 10 gm./litre of water recorded least insect pest incidence (3.67%) followed NSKE 4% (5.33%) and Bt formulation @ 500gm/ha. (8.0%).

Among all technological options HaNPV 250LE with jaggery 10 gm./litre of water showed best results, whereas Other bio-pesticides viz., *B. thuringiensis* and NSKE 4% showed 5.33%and 8.0% insect pest incidence found least effective but were superior over farmers practices (control). After10 days of 2ndspray, the fruit borer population was once again recorded minimum in plots treated with HaNPV 250LE. These findings are agreement with Abhijit *et al*., (2012) Sherad *et al.,* (2014).

Table.1 Impact of different bio pesticides for management practices on tomato fruit borer

Technology option	No. of trials	Yield component		Disease/ insect pest incidence (%)	Yield (q/ha)	Cost of cultivation (Rs./ha)	Gross return (Rs/ha)	Net return (Rs./ha)	BC ratio
		No. of effective fruits /plant	Weight of fruits/ plant (Kg)						
F.P-Spraying of cypermethin 10EC	**05**	**119.33**	**3.00**	**9.33**	**295**	**68500.00**	**295000.00**	**226500.00**	**4.30**
T.O.I- HaNPV 250LE with jaggery 10 gm./litre of water		**203.67**	**4.750**	**3.67**	**370**	**72800.00**	**370000.00**	**297200.00**	**5.08**
T.O.II- Bt formulation@500gm. per ha. at 10 days interval.		**128.00**	**3.700**	**8.00**	**310**	**70000.00**	**310000.00**	**240000.00**	**4.42**
T.O.III- NSKE 4% with sticker		**105.33**	**2.250**	**5.33**	**319**	**68200.00**	**319000.00**	**250800**	**4.67**
SE(d)		1.34	0.53	0.67	3.24				
CD(P=05)		2.95	1.15	1.75	7.03				

The input and output prices of commodities prevailed during the research year of on farm trail were taken for calculating yield, cost of cultivation, net return and benefit cost ratio (Table 1). The net return from technological option. I- HaNPV 250LE with jaggery 10 gm./litre of water, technological option. III-NSKE 4% with sticker and technological option. II- Bt formulation@500gm.per ha. at 10 days interval was Rs. 297200 to Rs. 250800

and240000 while the net return from Spraying of cypermethin 10EC (farmers practices) was Rs. 226500. It means that net return from technological option I, III and II was higher than the farmer practices. The cost ratio of was also calculated, it ranged from technological option I- Spraying of cypermethin 10EC (5.08), III--NSKE 4% with sticker (4.67) and II Bt formulation@500gm.per ha. at 10 days interval (4.42) was higher than the farmer practices (4.30). Thus, and it was clearly showed that the technological option.I- HaNPV 250LE with jaggery 10 gm./litre of water, technological option. III-NSKE 4% with sticker and technological option.II- Bt formulation@ 500gm.per ha. at 10 days interval was better than farmer's practices. Similar result has been reported by earlier by Karabhantanal, *et al.*, (2013) and Majumdar, *et al.*, (2015).

In conclusion technology option 1st (HaNPV 250LE with jaggery 10 gm./litre of water) performed bitter in the term of effectiveness and economics where as rest of the from technological option. III-NSKE 4% with sticker and technological option.II- Bt formulation@ 500gm.per ha. at 10 days interval at par. The disease incidence was also less.

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