The Pharma Innovation Journal 2022; 11(5): 1414-1416

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(5): 1414-1416

www.thepharmajournal.com
Received: 19-03-2022
Accepted: 21-04-2022

Vijay Kumar
Department of Entomology, SKRAU, Bikaner, Rajasthan, India

Lalita Verma
Department of Agronomy, Rajasthan Agricultural Research Institute, Durgapura, Jaipur, Rajasthan, India

Corresponding Author:
Vijay Kumar
Department of Entomology, SKRAU, Bikaner, Rajasthan, India

Response of different biopesticides on marketable yield of tomato (*Lycopersicon esculentum* Mill; Solanaceae)

Vijay Kumar and Lalita Verma

Abstract
A field experiment was conducted at research farm, MPUAT, Udaipur during *Rabi* 2015-16 seasons to study the Bioecology of tomato fruit borer and its management with biopesticides. The experiment was consisted of five treatment (T_1- Neem oil (3%) (3000 ppm), T_2- HaNPV (250 LE/ha), T_3- Bt (1.5 kg/ha), T_4- Spinosad 45 SC (200 ml/ha) and T_5- Control), Result showed that treatment Spinosad 45 SC (200 ml/ha)) found maximum marketable yield and proved significantly superior as compare to other treatments.

Keywords: Bioecology, biopesticides, tomato fruit borer

Introduction

Tomato (*Lycopersicon esculentum* Mill; Solanaceae) a popular vegetable throughout the world, ranks second in importance after potato in India, is cultivated in 8.79 million hactares with an annual production of 182.26 metric tonnes and an average productivity of 20.70 metric tonnes ha^{-1} (Anonymous, 2012-13) [1]. In Rajasthan, the annual production of tomato is 73.57 metric tonnes from 15.91 thousand hectares with an average productivity of 55 tonnes ha^{-1} (Anonymous, 2012-13) [1]. It is known as a protective food because of its special nutritive value as they contribute to a healthy and well-balanced diet. It is rich in minerals, vitamins, essential amino acids, sugars and dietary fibres. It also contains lycopene, an anti-oxidant that may contribute to protection against carcinogenic substances and decrease the risk of neurodegenerative diseases. It also provides colour and flavor to the food. Moreover, tomato has got medicinal properties, the pulp and juice of fruit is digestible, promoter of gastric secretion and acts as a blood purifier. Various factors have been attributed for the low yield of tomato including poor quality seeds, incidence of diseases and pests and adverse climatic conditions. Among these, insect pests are of prime importance that have negative affects not only on the yield but also the quality. The crop is infested by about 16 species of insect and non-insect pests right from germination to harvesting. Among the insect pests, jassid, *Amrasca biguttula biguttula* (Ishida) and *Empoasca panjabensis* (Pruthi), tomato fruit borer, *Helicoverpa armigera* (Hub.), tobacco caterpillar, *Spodoptera litura* (Fab), thrips, *Thrips tabaci* (Linn.), aphids, *Aphis gossypi* (Glover), *Lipaphis erysimi* (Kalt.) and *Myzus persicae* (Sulzer), white fly, *Bemisia tabaci* (Genn.) and epilachna beetle, *Epilachna dodecastigma* (Wiedemann), occur regularly during the cropping season (Butani, 1977) [2]. The tomato fruit borer, *Helicoverpa armigera* (Hub.) is a key pest as it infests fruits and makes them unfit for human consumption causing considerable (55%) crop loss (Selvanarayanan, 2000) [7]. It has been estimated that crops worth Rs.1000 crore are lost annually by this pest (Jayraj *et al.*, 1994) [5]. Over the years, the more common method for the control of this pest has been to have a film of a persistent effective insecticide over the foliage and fruiting bodies. However, the indiscriminate use of insecticides has eroded sustainability and resulted in buildup of pesticide residues, resistance to pesticides, resurgence and secondary outbreak of this pest (Fitt, 1989) [3]. Therefore, switching from the use of insecticides alone to more bio-intensive methods of pest management such as the use of trap crops, farmscaping and bio-pesticides has become the trend. Farmscaping provides protection by preventing the pests from reaching the main crop and enhancing the activities of natural enemies of pestiferous species. Trap cropping and planting of diversionary hosts have been widely applied and recommended in the past. African marigold among several rows of tomato specifically to control *H. armigera* on tomato was developed by entomologists at the Indian Institute of Horticulture Research. Tomato fruit worm adults prefers marigold at flowering stage for oviposition as compared to tomato, which reduced *H. armigera* infestation of tomato. Trap crop has an important attribute that is distinctly more attractive to the pest than the main crop and have additional function for natural enemies (Pats *et al*., 1997) [6].

Material and methods

The methodology used for conducting the experiment on "Bioecology of tomato fruit borer and its management with biopesticides" carried out at the Instructional Farm, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur during *rabi* (October 2015 to April 2016) has been presented in 4th chapter. The investigation was carried out at the Instructional Farm of Rajasthan College of Agriculture, MPUAT, Udaipur during *kharif* 2014 and 2015. Geographically, Udaipur is located at 23.4°N longitude and 75°E latitude at an elevation of 579.5 MSL in the state of Rajasthan.The climate of the region is subtropical, characterized by mild winter and hot summer and provides a safe and long growing season for most crops. The average annual rainfall of this tract ranges from 650 to 750 mm, most of which is received during July to September with occasional rain during the winter season. During summer, the temperature may shoot up to 45.5 °C, while in winter it may fall to as low as 4.5 °C. During the years 2014 and 2015 the annual precipitation was 693.20 and 823.20 mm. The experimental field was prepared by ploughing once followed by cross harrowing and planking. Required quantity of FYM @ eight to ten tons/ha was mixed with soil and inorganic fertilizers were applied as per recommendations.

The borer infested and healthy fruits of individual plots were sorted out after each picking and the numbers of infested and healthy fruits were recorded. The fruit infestation was recorded 1day before and 3, 5 and 7 days after spraying of treatments. The mean fruit borer infestation was computed on the basis of cumulative data of all picking.

The population data of *H. armigera* obtained was subjected for the conversion into per cent reduction using Henderson and Tilton (1955) [4] formula as under:

$$\text{Per cent reduction in population} = 100\left[1-\frac{T_a \times C_b}{T_b \times C_a}\right]$$

Where,

T_a = Number of insects after treatment
T_b = Number of insects before treatment
C_a = Number of insects in untreated check after treatment
C_b = Number of insects in untreated check before treatment.

The reduction percentage figures were transferred into arc sine values and subjected to analysis of variance.

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:

$$\text{Mean fruit damage (\%)} = \frac{\text{Number of damaged fruits}}{\text{Total number of fruit}} \times 100$$

The economics of different treatments was calculated by taking into consideration the cost of application of different treatments and prevailing market price of tomato. The total marketable fruit yields obtained from all plots were computed on hectare basis. The increase in fruit yield was calculated as yield increase in treated plots compared to untreated plots as follows:

$$\text{Percent increased yield} = \frac{\text{Increase yield treated plot}}{\text{Yield in untreated plot}} \times 100$$

Cost benefit ratio was calculated by deducting the cost of insecticidal treatments from price of increased yield over control by using following formula:

$$\text{B:C ratio over control} = \frac{\text{Returns in treatment (Rs./ha)}}{\text{Returns in control (Rs./ha)} + \text{Cost of insecticides and labour (Rs./ha)}}$$

The marketable yield of tomato after each picking was recorded separately for each treatment. The yield of all pickings was pooled together for each treatment separately and yield per hectare was computed.

Result and Discussion

The marketable yield of tomato among different treatment ranged from 52.06 to 108.55 kg/plot. The highest marketable yield of 108.55 kg/plot was recorded in case of Spinosad 45 SC (200ml/ha). It was significantly higher than all other treatments. It was followed by HaNPV (250 LE/ha) and Bt (1.5 kg/ha) which yielded 97.80 kg/plot and 94.06 kg/plot. Neem oil (3%) and which yielded 72.23 kg/plot against 52.06 kg/plot in control.

The ultimate aim to protecting the crop from insect pests with the use of bio-pesticides is to increase the production at economic level by reducing the pest damage. Therefore the increase in yield due to use of those pesticides and net monetary returns were assessed to screen the most economical pesticide treatments.

Effects of different treatments on marketable yield of tomato during *rabi* 2015-16

Treatments	Yield (kg/plot)	Yield (q/ha)
T_1: Neem oil @ 3000 ppm	72.23	167.20
T_2: NPV @ 250 LE	97.80	226.40
T_3: Bt @ 1.5 kg	94.06	217.74
T_4: Spinosad 45 SC @ 200 ml	108.55	251.29
T_5: control	52.06	120.51
S. Em +_	0.980	
CD at 5%	3.01	

Conclusion

The highest marketable yield of 108.55 kg/plot was recorded in case of Spinosad 45 SC (200ml/ha). It was followed by HaNPV (250 LE/ha) and Bt (1.5 kg/ha), which yielded 97.80 kg/plot and 94.06 kg/plot, respectively. Neem oil @ 3% yielded the lowest marketable of 72.23 kg/plot.

References

1. Anonymous. Indian Horticulture Database, National Horticulture Board, ministry of agriculture, Krishi Bhawan, govt. of India, New Delhi, India, 2012-13, 192 & 297.
2. Butani DK. Insect pest of vegetables: tomato Pesticides. 1977;11:33-36.

3. Fitt GP. The Ecology of *Heliothis* Species in relation to agro-ecosystems, Annual Review of Entomology. 1989;34:17-53.
4. Henderson CF, Tilton EW. Test with against the brown wheat mite. Journal of Economic Entomology. 1955;48:157-161.
5. Jayraj S, Ananthakrishnana TM, Veeresh GK. Biological pest control in India: Progress and perspective. RGICS Project No.2, Rajiv Gandhi Institute of Contemporary Studies, New Delhi, 1994, 101p.
6. Pats P, Ekbom B, Shovgard M. Influence of intercropping on the abundance, distribution and parasitism of *Chilo* spp. (Lepidoptera: Pyralidae). Bulletin of Entomological Research. 1997;87:507-513.
7. Selvanarayanan V. Host plant resistance in tomato against fruit borer, *H. armigera* (Hub.). Ph.D. Thesis submitted in Annamalai University, Annamalainayar, India, 2000.