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EFFICACY OF BIO-PESTICIDES AGAINST TOMATO FRUIT BORER, *HELICOVERPA ARMIGERA* (HUBNER)

Pramod Balmala*, B. Gangwar, Abhishek Kumar Chaudhary, Pradeep Kumar and Muskan Sagar

Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi- 284 128, India
*e-mail : sainipramod96@gmail.com

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ABSTRACT : Field studies were conducted on the efficacy of bio-pesticides against tomato fruit borer *Helicoverpa armigera* (Hubner) at the experimental field, Organic Research farm Kargunawa ji, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Utter Pradesh) during *Rabi* Season of 2021-22. Different bio-pesticides *viz*., Neem oil, *Beauveria bassiana, Bacillus thuringiensis* (5% WP), Castor oil, Panchgavya, Neem Seed Kernel Extract (Crude extract), *Verticillium lecanii* (2×10^8 cfu) and Garlic bulb extract were evaluated. Experimental results revealed that the plant treated with bio-pesticides registered a significant difference in tomato fruit borer over the treatment of untreated control. Among them, the treatment of *Beauveria bassiana* (6.10 larvae/5 plant) was found in significantly more effective against the pest as compared to other bio-pesticides. *Bacillus thuringiensis*, NSKE, Neem oil and *Verticillium lecanii* were found moderately effective and proved significantly superior over Castor oil, Panchgavya and Garlic bulb extract proved significantly less effective among the bio-pesticides evaluated against tomato fruit borer.

Key words : Tomato, fruit borer, *Helicoverpa armigera*, bio pesticides.

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INTRODUCTION

Vegetables are an important part of healthy eating and a source of providing many nutrients, including potassium, fiber, folic acid and vitamins A, E and C. India is the second largest producer of vegetables with 2.8 per cent of the total cropped area. The present production of 1.5 million tons of vegetables, supplies only 145 grams per capita per day against recommended vegetable requirements of 300 grams. Therefore, an increase of 2.5 per cent per year in vegetable production is necessary. Tomato *Solanum lycopersicum* (L.) belonging to the family Solanaceae, is an important vegetable. Tomatoes were first used as food by the "Aztecs" in Southern Mexico. Tomato is a warm-season crop; requires a warm and cool climate for its successful cultivation.

Tomato fruit contains water 93.10%, protein 1.90%, fat 0.3 g, fibre 0.70%, carbohydrates 3.60%, calorie 23, and vitamin 'A' 320 I. U., vitamin 'B1' 0.07 mg, vitamin 'B2' 0.01 mg, nicotinic acid 0.4 mg, vitamin 'C' 31 mg, calcium 20 mg, phosphorus mg, and iron 0.80 mg. (Mandloi, 2013). Tomato is a perennial in its native habitat, although often grown outdoors in temperate climates as an annual herb. In India, it is cultivated in 781 thousand ha area with 19007 MT production and 24.33 ton/ha productivity. In Utter Pradesh, the total area of tomatoes is 21.24 thousand ha with 841.61 thousand MT production and 39.61 ton/ha productivity In Bundelkhand Region, Jhansi district of Utter Pradesh it occupies an area of about 1.194 thousand ha (Anonymous, 2019).

The production quality of tomato fruits is considerably affected by an array of insect pests infesting at different stages the time of crop growth. The major insect pests which play the most important role in the economic losses of tomato crops are leaf miners, aphids, jassids, white flies, and fruit borers. Total of 41 insect-pest species, belonging to 21 families attack tomato crop (Reddy and Kumar, 2004). The estimated losses to tomatoes due to attacks of different insect pests have been reported in the range of 32-36% (Anonymous, 2021).

Fruit borer *Helicoverpa armigera* (Hub.) a gradually attaining the major pest status in a different region of the country and it causes Heavy losses in tomato crop.

Table 1 : Efficacy of different treatments against tomato fruit borer *Helicoverpa armigera* during 1st spray (No. of larvae/ 5 plants).

Treatment	Before Spray	3 DAS	7 DAS	14 DAS	Overall Mean
T_1 Neem oil	14.92	12.18	11.65	13.17	12.33
T_2 *Beauveria bassiana*	11.41	9.47	9.27	8.50	9.08
T_3 *Bacillus thuringiensis*	10.64	10.20	10.15	9.95	10.10
T_4 Castor Oil	15.91	15.40	14.76	14.37	14.84
T_5 Panchgavya	14.38	14.15	14.86	16.30	15.10
T_6 NSKE	14.09	12.29	10.46	11.72	11.49
T_7 *Verticillium lecanii*	12.32	11.92	13.30	15.23	13.48
T_8 Garlic bulb extract	16.91	16.48	16.81	16.66	16.65
T_9 Water spray (control)	14.09	19.01	20.18	20.47	19.89
C.D. at 5%	NS	2.63	2.89	3.33	1.47
S.Em.±	-	0.87	0.96	1.10	0.49

Figures in the parentheses are √x+0.5 transformed values, *DBS-day before spraying, *DAS-days after spraying.

Table 2 : Efficacy of different treatments against tomato fruit borer *Helicoverpa armigera* during 2nd spray (No. of larvae/ 5 plants).

Treatment	Before Spray	3 DAS	7 DAS	14 DAS	Overall Mean
T_1 Neem oil	13.17	10.64	9.81	8.74	9.73
T_2 *Beauveria bassiana*	8.50	7.22	6.14	4.94	6.10
T_3 *Bacillus thuringiensis*	9.95	8.78	7.81	6.64	7.74
T_4 Castor Oil	14.37	12.81	11.06	10.24	11.37
T_5 Panchgavya	16.30	13.58	12.07	10.78	12.14
T_6 NSKE	11.72	9.95	8.86	7.88	8.90
T_7 *Verticillium lecanii*	15.23	11.96	10.15	9.13	10.42
T_8 Garlic bulb extract	16.66	14.76	12.61	11.28	12.88
T_9 Water spray (control)	20.47	21.10	21.67	21.91	21.56
C.D. at 5%	3.33	2.76	2.72	2.35	1.08
S.Em.±	1.10	0.91	0.90	0.78	0.36

Figures in the parentheses are √x+0.5 transformed values, *DBS-day before spraying, *DAS-days after spraying.

pesticide for managing insect pests of potato and recorded the highest per cent protection over control against major insect pests of potato with chlorpyriphos 20 EC @ 2.50 ml/l across two *kharif* seasons. This was followed by NSKE @ 5 per cent (42.36 and 66.19%), azadirachtin 3000 ppm @ 3.00 ml/1 (42.43 and 62.16%) and neem oil @ 2 per cent (35.52 and 48.39%) with respect to shoot borer and aphids. However, in case of leafhopper, neem oil @ 2 % proved to be the next best treatment (62.92%). The treatment, azadirachtin 3000 ppm @ 3.00 ml/1 recorded the highest per cent protection over control in the case of mites (44.49%) and defoliator, *Spodoptera litura* (Fab.) (52.04%).

Mudigoudra *et al* (2009) concluded that plant products like NSKE @ 5% in combination with panchagavya @ 3% or cow urine @ 5% were as effective as that of chemical insecticides in reducing shoot fly infestation in *kharif* sorghum. Balikai *et al* (1997) reported that lower pod damage (39.8%) and higher seed yield (10.2 q/ha) were recorded in the treatment that received three rounds of sequential spray of HaNPV @ 250 LE/ha – cypermethrin@ 0.01% - neem seed kernel extract @ 5% given at 15 days interval starting from 50% flowering in red gram.

CONCLUSION

On the basis of the result and discussion of the present investigation, the following recommendations and conclusions are proposed. *Beauveria bassiana* proved significantly superior overall to the bio-pesticides in reducing the tomato fruit borer *Helicoverpa armigera* larval population, providing a significantly higher yield.

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REFERENCES

Anonymous (2019) Horticultural Statistics, Production and Productivity Data for Different States of the Country - 2018-19. Ministry of Agriculture & Farmers Welfare, Govt. of India, New Delhi, India.

Anonymous (2021) IPM strategies for tomato and cabbage, extension folder. National

Center for Integrated Pest Management (ICAR), Pusa campus, New Delhi 110 012, India.

Balikai R A, Giraddi R S, Yelshetty S and Sattigi H N (1997) Control of *Helicoverpa armigera* (Hubner) on red gram with neem seed extract, Bellary jali leaf extract, NPV and insecticides. *Karnataka J. Agric. Sci.* **10**(4), 999-1002.

Chavan R D, Yeotikar S G, Gaikwad B B and Dongarjal R P (2015) Management of major pests of tomato with bio-pesticides. *J. Entomol. Res.* **39**(3), 213-217.

Herald K P and Tayde A R (2019) Effect of bio-pesticides singly and in combinations for the management of tomato fruit borer, *Helicoverpa armigera* (Hubner). *J. Entomol. Zool. Stud.* **7**(5), 1309-1313.

Mandloi R (2013) Study on seasonal incidence of insect pest complex of tomato (*Solanum lycopersicum* L.) and their management with phyto extracts. *M. Sc. (Agri.) Thesis*, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.), India.

Mudigoudra S, Shekharappa and Balikai R A (2009) Evaluation of plant products in combination with cow urine and panchagavya against sorghum shoot fly, *Atherigona soccata* Rondani. *Karnataka J. Agric. Sci.* **22**(3), 618-620.

Natikar P K and Balikai R A (2019) Evaluation of botanical and bio-pesticides against major insect pests of potato during *kharif* season. *J. Eco-friendly Agric.* **14**(1), 72-77.

Reddy N A and Ashok Kumar C T (2004) Insect pests of tomato, *Lycopersicon esculentum* Mill. in eastern dry zone of Karnataka. *Insect Environ.* **10**(1), 40-42.

Tejeswari Kota and Ashwani Kumar (2021) Comparative efficacy of chemicals with bio-pesticides against tomato fruit borer, *Helicoverpa armigera* (Hubner) on tomato, *Solanum lycopersicum* (L.) under field conditions Kota. *J. Entomol. Zool. Stud.* **9**(5), 425-429.