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Evaluation of Biocidal Efficacy of Botanicals Against Tomato Fruit Borer (*Helicoverpa armegera* Hubner) at Field Level

MAN BIHARI, SURYA NARAYAN[1] AND RANJAN KUMAR SINGH[2]

[1]*Department of Horticulture K. A. P. G. College, Allahabad, India*
[2]*Krishi Vigyan Kendra, Jamui 811313, Bihar, India*

Abstract

Biocidal effect of botanicals was found significant in managing tomato fruit borer of winter crop in Allahabad condition. Lowest fruit borer infestation (5.84%) was recorded in NSKE followed by (7.13%) in NLE, (8.44%) in TLE and (9.08%) in OGBE respectively. Highest infestation (27.49%) was observed in control. Minimum fruit damage (7.73%) was recorded in NSKE while maximum (29.05%) in control. Plant vigor was also found to be influenced by botanicals application. Plant height, number of branches per plant, number of flower clusters per plant and number of fruit set per plant were recorded maximum (62.39 cm, 12.43, 83.45, 32.47) in NSKE while minimum (52.39 cm, 8.44, 69.43, 20.84) in control respectively. Insignificant effect among the botanicals for vigor parameters were observed while highly significant effect was showed in relation to control. Highest fruit yield (36.98 t/ha) was recorded in NSKE which was 73.28% more over control. Next best results were observed in NLE (34.34 t/ha) and TLE (32.98 t/ha). Lowest yield (21.34 t/ha) was observed in control. Net gain over control was maximum (Rs 75,850) in NSKE followed by (Rs 63,750) in NLE. The ICBR indicated that NLE (1:51.00), OGBE (1:50.81), CLE (1:47.22) and TLE (1:47.112) were most economic treatments. Precisely it may concluded that NSKE at 5% applied five times at fort night interval after one month of planting to get minimum fruit infestation and damage, maximum fruit yield and maximum net gain over control. In respect to ICBR wide range of botanicals may be chosen for the purpose.

Key words : Tomato, Botanical Pesticides, NSKE, Fruit Borer, *Helicoverpa.*

Biotic stresses are dominant features in controlling the yield and quality of vegetable crops. Among them insects were first in their importance. Tomato borer is devastating insect at field level and cause huge economic damage with congenial environment. Synthetic pesticides are very effective but their residual effect on soil, water and food created noticeable problem which found to cause fauna and flora erosion. Our natural vegetation has immense potential to control these noxious pests. Several herbs have been identified for their insecticidal potentiality. These botanicals may be applied repeatedly without any health hazard over the organisms of the vicinity. These are ecofriendly, economically viable and ease in local availability. In contrast to controlling, these are effectively used to mange pest population below economic injury level. These may be incorporated as one of the potent tool of integrated pest management which is a need of the day. These have been recognized as vigor promoter being reservoir of essential mineral elements required by the plant. Their residual effects are nominal and are liable to degrade with short time unlike synthetic pesticides which take long time. Vegetables generally consumed in fresh form and after flowering within a week these attain consumable quality. Application of chemicals during this stage is injurious being lack of time to detoxification of residual effect. Salad vegetables like tomato and chilli which are consumed in raw form the situation is more alarming with synthetic pesticides. Keeping above in view an attempt was made to explore the effect of botanicals on tomato fruit borer under field conditions in Allahabad.

Methods

The field experiment was conducted at the Department of Horticulture, K. A. P. G. College, Allahabad during the year 2005-06. There were 12 treatments including a control replicated thrice in a randomized block design. The cultivar Rupali seedlings of 25 days old having uniform size were used for trans-

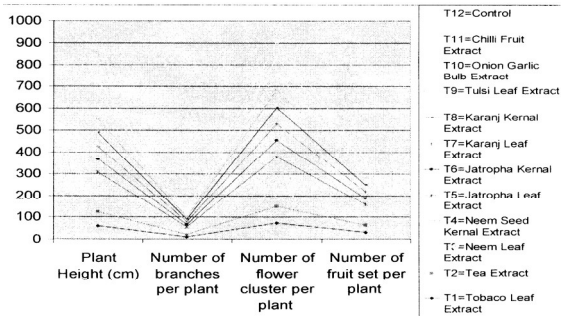

Figure 1. Effect of botanical pesticides on vigor of tamato plant (pooled data 2006 and 2007).

planting at 60 × 60 cm in each plot having the size of 3.6 × 6.0 m. All the agronomical practices were done as per recommendation. Elevan botanicals viz., tobacco leaf extract (TLE), tea extract (TE), neem leaf extract (NLE), neem seed kernel extract (NSKE), jetropha leaf extract (JLE), jetropha kernal extract (JKL), karanj leaf extract (KLE), karanj kernal extract (KKE), tulsi leaf extract (TuLE), onion-garlic bulb extract (OGBE), and chilli fruit extract (CFE) were taken for the study. Leaf extracts were prepared by crusting fresh leaves with water to make 10% solution. Kernal extracts were prepared by crushing Kernals with water to make 5% solution; garlic-onion bulb Extract was prepared by crushing bulbs of garlic and onion taken in the ratio 1:1 each. Ripened chilli fruits were crushed with water making 5% solution. Manufactured tea was boiled in water and strained making 5% solution. The pesticides were applied five times at forthrightly interval commencing at one month after transplanting. Plant height was taken at flowering stage with longest stem. Number of braches per plant counted as secondary and tertiary branches available at first flush. Number of flower clusters per plant were counted as cluster available up to last flush (second) of the crop. Number of fruit set per plant were recorded as the size of fruit-let reaches to pea size. Fruit borer infestation percentage was counted as number of larvae appeared per plant. Fruit damage was taken on the weight basis as percentage damage of total yield per plant. Mean yield was calculated in t/ha. Economics of botanicals in tomato protection was worked out.

Table 1. Effect of botanical pesticides on vigor of tomato plant (pooled data 2006 and 2007.

Treatments	Plant height (cm)	Number of branches per plant	Number of flower cluster/ plant	Number of fruit set/ plant
T_1 Tobaco leaf extract	61.43	11.54	73.09	31.09
T_2 Tea extract	62.04	10.98	73.83	31.54
T_3 Neem leaf extract	60.33	11.11	75.43	30.08
T_4 Neem seed kernal extract	62.54	12.43	83.45	32.47
T_5 Jatropha leaf extract	59.39	10.09	72.78	30.43
T_6 Jatropha kernal extract	60.44	11.53	76.54	31.09
T_7 Karanj leaf extract	59.48	10.00	72.09	30.37
T_8 Karanj kernal extract	62.39	10.73	74.44	30.79
T_9 Tulsi leaf extract	60.88	11.08	80.85	32.10
T_{10} Onion garlic bulb extract	60.38	12.33	73.40	31.73
T_{11} Chilli fruit extract	61.39	10.88	80.10	32.00
T_{12} Control	52.39	8.44	69.43	20.84
SE ±	8.734	3.439	29.734	8.334
CD at 5%	2.947	2.094	11.432	3.213

Results and Discussion

Encouraging results were obtained with botanical pesticides. All the botanicals yielded significant effect in fruit borer management of tomato crop (Tables 1 and 2). Plant vigor was also affected by botanicals application. All the botanicals were found to influence significantly the vigor of the plant in comparison to control. But among the botanicals the effect was insignificant. Maximum plant height (62.54 cm) was recorded in NSKE followed by (62.39 cm) in KKE. Among the botanicals Jatropha leaf extract produced shortest (59.39 cm) plant height. Control was found significantly lower (52.39 cm) in plant height among all the treatments. The range of number of branches per plant (8.44—12.43) were found to vary significantly. The highest number of branches per plant (12.43) were observed in NSKE treatment while lowest value (8.44) was recorded in control. Number of flower cluster and fruit set per plant were also found better with botanicals in comparison to control. Higher number of flower cluster and fruit set per plant (83.45—32.47, 80.85—32.10 & 80.10—32.00) were recorded in NSKE, TuLE and CFE respectively.

Fruit borer infestation (number basis) was lowest (5.84) in NSKE fallowed by (7.13) NLE and (8.44) TLE respectively. Maximum infestation was (27.49)

Table 2. Effect of botanical pesticides on tomato fruit borer management (pooled data 2006 and 2007).

Treatments	Fruit borer infestation (%) No. Basis	Decreased over control (%)	Fruit damage (%) Wt basis	Decreased over control (%)	Yield of tomato Mean yield (t/ha)	Increased over control (%)	Total cost of treatment (Rs/ha) (A)	Economic Value of increased yield over control (B)	Net gain over control C=(B-A)	ICBR (C/A)
T_1 Tobacco leaf extract	8.44	69.29	10.43	64.09	32.89	54.12	1200	57750	56550	1:47
T_2 Tea extract	17.53	36.23	19.57	32.63	31.10	45.64	2660	48700	46040	1:17
T_3 Neem leaf extract	7.13	74.06	9.33	67.88	34.34	60.91	1250	65000	63750	1:51
T_4 Neem seed kernal extract	5.84	78.75	7.37	73.88	36.98	73.28	2350	78200	75850	1:32
T_5 Jatropha leaf extract	14.43	47.50	16.34	73.39	31.09	45.68	1250	48750	47500	1:38
T_6 Jatropha kernal extract	12.13	53.87	14.55	43.75	31.93	49.62	2400	52950	50550	1:21
T_7 Karanj leaf extract	16.35	40.42	18.09	49.81	31.00	45.26	2300	48300	46000	1:20
T_8 Karanj kernal extract	14.94	45.65	16.77	37.72	31.00	45.26	2400	48300	45900	1:19
T_9 Tulsi leaf extract	9.93	63.87	11.75	42.27	32.44	52.01	200	55000	52800	1:24
T_{10} Onion garlic bulb extract	9.08	66.96	11.03	62.99	32.74	53.42	100	57000	55900	1:50
T_{11} Chilli fruit extract	10.01	63.58	12.05	62.03	31.95	49.71	100	53050	51950	1:47
T_{12} Control	27.49	–	29.05	58.58	21.34	–	–	–	–	–
SE ±	0.13	–	0.83	–	2.93	–	–	–	–	–
CD at 5%	5.79	–	12.11	–	7.43	–	–	–	–	–

recorded in control. Fruit damage (weight basis) was also followed the same pattern and minimum fruit damage (7.73) was in NSKE followed by (9.33) NLE and (10.43) TLE respectively. Greatest damage was observed (29.05) in control.

Mean yield was found to influenced significantly. The range was recorded 36.98—21.34 t/ha. NSKE aroused 73.28% more yield over control. Other better results were in NLE, TLE, OGBE and TuLE respectively. Value of increased yield over control was maximum (Rs. 78200) in NSKE followed by (Rs 63750) in NLE. Net gain over control is the most striking feature and maximum net gain (Rs 75850) was observed in NSKE followed by (Rs 67,500) in NLE. All the botanicals yielded more than Rs 45,000/ha net gain over control is the noticeable feature. Incremental cost benefit ratio was greater (1:51, 1:50 and 1:47) in NLE, OGBE, and CFE respectively.

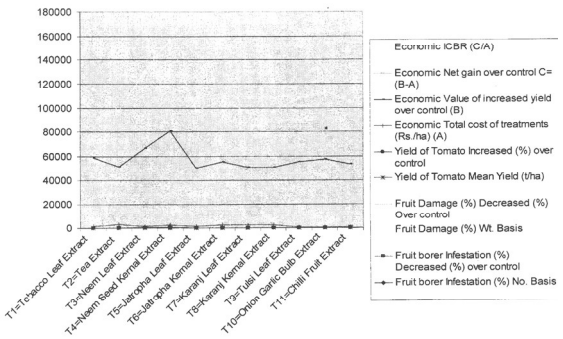

Figure 2. Effect of botanical pesticides on tomato fruit borer management Poole data 2006 and 2007.

Botanicals had reflected dual theory of action and significantly influenced the plant vigor and fruit borer population of tomato crop. Being organic substances they have plentiful amount of essential plant nutrients and when applied through foliar spray act as fertilizer which increase the vigor of the plant. These botanicals have hormones which also help in growth acceleration. Borer population was significantly managed and damage percentage was minimized. It clearly indicates their biocidal potency. All kind of botanicals used had reflected their pesticidal nature with little difference in their knockout effect. These findings are in conformity with the findings of Patel et al. (1), Sachan et al. (2), Singh and Narang (3), Ramesh and Ukey (4), Singh and Ram (5).

Precisely it may be concluded that botanicals may be used efficiently in manage of tomato fruit borer. Among the botanicals tried NSKE at 5% fortnightly application from one month after transplanting may be used commercially at field level.

References

1. Patel J. R., P. K. Borad, H. C. Ratanpara and B. R. Shah. 1991. Need based control of *Helicoverpa (Heliothis) armigera* on tomato with endosulfan. *Ind. J. Pl. Proto.* 19 : 79—80.
2. Sachan J. N. and S. S. Lal. 1990. Role of botanical insecticides in *Helicoverpa armigera* management. *Nat. Symp. on Problems and Prospects of Botanical Pesticides in IPM.* 21—22 Jan, 1990. CTRI, Rajahmundry, India.
3. Singh D. and D. D. Narang. 1990. Control of tomato fruit borer *Heliothis armigera* Hubner with synthetic pyrethroids. *Ind. J. Ent.* 52 : 534—540.
4. Ramesh R. and S. P. Ukey. 2006. Bio-efficacy of botanicals, microbials, microbials and newer insecticides against tomato fruit borer (*Helcoverpa armegera* Hubner). *J. Nat. Resour & Develop.* 1 : 5—8.
5. Singh P. K. and M. Ram. 2006. Field evaluation of eco-friendly insecticide and pesticide against brinjal shoot and fruit borer (*Leucinodes oronalis* Guen). *Souvenir on 8th Indian Agricultural Scientists and Farmer's Cong.* Feb 2006. BHU, Varanasi, India. 21pp.