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Original Research Article

Evaluation of certain botanicals, microbials: An conventional insecticide against mealybug infesting tomato

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A B S T R A C T

The field experiment was conducted to evaluate effectiveness of botanicals, microbials and conventional insecticide against mealy bugs infesting tomato. The treatment with neem seed extract 5 per cent noted lowest incidence of mealybug (0.48 and 0.42/ 10 cm twing) on 3 and 7 DAS, respectively. It was followed by the treatments with other neem based material. While, the treatments with microbial was found to have marginal impact against mealybugs. The treatment with other botanicals also performed positive impact against mealybugs. Regarding the yield of tomato fruit, the highest fruit yield of 86.48 q/ha than control was obtained from endosulfan 0.05% followed by other neem based treatments. The other botanicals also performed well in producing better yield. The highest ICBR of 1:30.39 was obtained in endosulfan 0.05% followed by the treatment with neemleaf extract 5% and neem seed extract 5%, while, the treatment with neem oil 1% had gained less ICBR. The treatment with microbial also get the less ICBR due marginal yield potentiality and reduced cost of treatments.

Keywords

Botanicals, Conventional insecticide, Mealybugs, Microbial, Tomato.

Introduction

Tomato (*Lycopersicon esculentum* Mill) is one the most important vegetable crop of the globe due to its immense commercial and nutritive value. The unit area productivity in India is 19 tonnes per hectare (Anonymous, 2006) whereas, its productivity potential is considered to be as 19 tonnes per hectare (Singhal, 1996).

Among the several problem that created obstacles for tomato productivity and quality fruits, the heavy losses caused by insect pests are the main constraints in maximizing the yield of the crop. The tomato is known to be infested by a myriad of insect pests right from germination till harvest of the fruit. Recently, the infestation of mealybugs on tomato crop also contributed in decreasing yield of crop. In spite the use of several chemical insecticides to manage this pest, the pest problem remains unsolved. Moreover the use of chemical leads to several consequential problem like pest resistance, resurgence, residues in the commodity and ill effect on ecosystem, etc. the present investigations were, therefore, undertaken to evolve integrated approaches

for management of insect pest complex of tomato through the use of botanicals, microbials and conventional insecticide.

Materials and Methods

The field experiment was conducted at the Experimental Farm of Department of Agricultural Entomology, Dr. PDKV, Akola during the *kharif* season of the two consequent years i.e. 2005-06 and 2006-07. Thirteen treatments (Table 1) including an untreated control were laid out in Randomized Block Design (RBD) with three replications. The healthy Pusa Ruby seedlings of about 30 days old having uniform size were used for transplanting on hills marked at 60 x 60 cm in each plot having the size of 3.6 x 6.0 m. All the agronomic practices as per recommendations were timely followed. In order to know the incidence of mealybugs, five plants were randomly selected in each treatment plot and they were tagged. Its population count was recorded on upper portion of 10 cm twig of selected plant at 3 and 7 days after spraying.The cumulative data were statistically analysed after appropriate transformation (Gomez and Gomez, 1984).

Results and Discussion

The two year pooled data of the present investigation as regard to the incidence of mealybugs revealed that least incidence to the tune of 0.48 and 0.42 mealy bug / 10 cm. twig was recorded in the treatment with spray application of neem seed extract 5 per cent on 3 and 7 DAS, respectively. Likewise, the treatment with neem oil 1 per cent and the treatment with neem leaf extract 5 per cent also show promising impact against this pest exhibiting mealybug incidence to the extent of 0.83 & 1.16 and 1.30 & 1.34/10cm twig on 3 and 7 DAS, respectively. Thus, it could be found that the application of neem based material had exerted the influencing effect against mealybugs. These findings of the present investigations on the positive impact of neem based material against mealybugs are not comparable with earlier workers for want of published literature.

The treatment with spray application of NSE 5 per cent alternated with either Btk at 1000 ml/ha or HaNPV at 250 LE/ha had diminished the effectiveness noting increased population of mealybug to the extent of 3.06 &3.48 and 3.59 & 3.94/10cm twig in respective treatments on 3 and 7 DAS, respectively. The diminishing efficacy of the treatment of NSE 5 per cent when alternated with *Btk* or HaNPV was due to the reduced frequency and prolonged interval of spray application of NSE 5 per cent and non effectiveness of Btk and HaNPV against meal bugs.

The treatment with endosulfan 0.05 per cent and the treatment with mahua oil 1 per cent had exhibited the promising impact against mealybugs showing its incidence to the extent of 1.80 & 1.72 and 2.01 & 2.03/10 cm twig on 3 and 7 DAS, respectively.

The treatment with other botanicals noted the marginal impact against this pest, while the treatment with microbial *Photorhabdus luminescence* at 2.5 ml/lit water shown poor impact against this pest recording the incidence of mealybug to the tune of 3.63 and 4.37/10 cm twig on 3 and 7 DAS, respectively and this treatment was observed to be statistically as equal to that of untreated control in which the maximum incidence of mealybugs to the extent of 4.36 and 5.43/10 cm twig was observed on respective days.

Yield

The pooled data of the present investigation revealed that the treatment with spray of endosulfan 0.05% had recorded the highest yield of tomato fruits to the tune of 86.48 q/ha as against the minimum yield of 44.42 q/ha in untreated control and it was found to be significantly superior over all the treatments. The high yield potentiality of endosulfan might have attributed to the positive impact of this treatment against major sucking pest as well as leaf miner and fruit borer the similar results regarding the high yield potentiality of insecticides endosulfan treated plots were reported by Patel *et al.,* (1998) confirming the present findings.

The other neem based treatments *viz.,* the treatment with spray application of neem leaf extract 5 per cent, neem seed extract 5 per cent and neem oil 1 per cent registered the yield of tomato fruits to the tune of 72.61 q/ha, 68.67 q/ha and 67.31 q/ha, respectively and they were found to be statically equal effective among themselves. This promising yield performance in neem based material is certainly due to positive impact of these treatments against sucking pests, leaf miner and tomato fruit borer. The findings of the present investigations on the positive influence of these neem based material on the yield of tomato fruits are in conformity with the reports of Meracado and Guerrero (1992) and Mahadevan (1998), who observed the similar impact of neem based material in getting increased yield of tomato fruits.

Among the other botanicals, the treatment with spray of nirgudi leaf extract 5 per cent, giripushpa leaf extract 5 per cent, garadi leaf extract 2.5 per cent, mahua oil 1 per cent and karanj oil 1 per cent had shown the good performance in producing 62.56 q/ha, 62.35 q/ha, 61.28 q/ha, 61.21 q/ha and 59.25 q/ha yield of tomato fruits which attributed to its positive efficacy of these treatment over leaf miner and sucking pest. These findings of the present investigations could not be compared with other workers as no information on the yield potentiality of these treatments are available in published literature. However, the treatment schedule consisting spray application of neem seed extract 5 per cent alternated with Btk, or HaNPV at 250 LE/ha and the treatment with spray of *Photorhabuds luminescens* at 2.5 ml/lit water had obtained the yield of tomato fruits to the tune of 58.85 q/ha, 57.89 q/ha and 56.59 q/ha, respectively. This poor yield potentiality is certainly attributed the lower efficacy of these microbials against sucking pests and leaf miner. The findings of the present investigation on low yield potentiality of Btk do find support with the reports of Ramesh and Ukey (2006).

ICBR:

The pooled data depicted on ICBR as influenced by the various treatment revealed that the insecticidal treatment of endosulfan 0.05 %, fetched maximum cost benefit ratio (1:30.39) and appeared to be the most economically viable treatment owing to their efficiency in controlling insect pests, moderately higher yield and low cost of insecticides incurred on its application. The similar highest ICBR of insecticidal treatment of endosulfan was also reported by Patel *et al.* (1991) and Pawar *et al.* (1996). Supporting the findings of the present investigation.

The treatments with neem based materials *viz.,* spray of neem leaf extract 5 per cent and spray of neem seed extract 5 per cent found to be next profitable treatment getting the ICBR of 1: 25.75 and 1: 16.41, while,

Table.1 Effect of treatment on mealybug infestation at 3 DAS and 7 DAS, yield of tomato fruits and ICBR

Tr No.	Treatments	No.ofmealybugs/10cm.twig at 3 DAS			No. of mealybugs/10cm.twig at 7 DAS			Mean yield (q/ha)	Total cost of treatments Rs. (ha) (A)	Value of yield over control (B)	Net gain over control (C)B-A	ICBR C/A
		2005-06	2006-07	Pooled mean	2005-06	2006-07	Pooled mean					
T_1	Neem oil 1%	0.60 (0.77)	1.07 (1.23)	0.83 (0.90)	0.84 (0.91)	1.49 (1.22)	1.16 (1.06)	67.31	3474	27108	23634	1:6.80
T_2	Karanj oil 1 %	2.87 (1.69)	2.07 (1.44)	2.47 (1.57)	2.53 (1.59)	2.92 (1.70)	2.72 (1.64)	59.25	2574	17436	14862	1:5.77
T_3	Mahua oil 1 %	2.14 (1.47)	1.86 (1.36)	2.01 (1.41)	2.11 (1.45)	1.95 (1.39)	2.03 (1.42)	61.21	4374	19788	15414	1:3.52
T_4	Neemseed extracts 5 %	0.06 (0.24)	0.90 (0.94)	0.48 (0.59)	0.38 (0.61)	0.46 (0.67)	0.42 (0.64)	68.67	1650	28740	27090	1:16.41
T_5	Neemleaf extract 5 %	1.59 (1.26)	1.01 (1.00)	1.30 (1.13)	1.59 (1.26)	1.09 (1.04)	1.34 (1.15)	72.61	1251	33468	32217	1:25.75
T_6	Garadi leaf extract 2.5 %	3.30 (1.81)	2.62 (1.61)	2.96 (1.71)	2.94 (1.71)	3.32 (1.82)	3.13 (1.76)	61.28	1824	19872	18048	1:9.89
T_7	Giripushpa leaf extract 5 %	2.18 (1.47)	2.06 (1.43)	2.12 (1.45)	2.22 (1.48)	2.76 (1.66)	1.49 (1.57)	62.35	1824	21156	19332	1:10.60
T_8	Nirgudi leaf extract 5 %	3.21 (1.79)	2.05 (1.43)	2.63 (1.61)	2.54 (1.59)	3.25 (1.80)	2.89 (1.69)	62.56	2274	21408	19134	1:8.41
T_9	NSE 5 % alternated with Btk @ 1000 ml/ha	3.44 (1.85)	2.68 (1.63)	3.06 (1.74)	3.28 (1.81)	3.68 (1.91)	3.48 (1.86)	28.85	2632.5	16956	14323.5	1:5.44
T_{10}	NSE 5 % alternated with HaNPV @ 250 LE/ha	3.64 (1.90)	3.54 (1.88)	3.59 (2.84)	3.53 (1.87)	4.35 (2.08)	3.49 (1.97)	57.89	6736.5	15804	9067.5	1:1.34
T_{11}	Photorhabdusluminescens @ 2.5 ml/lit water	3.89 (1.97)	3.37 (1.83)	3.63 (1.90)	4.66 (2.15)	4.08 (2.01)	4.37 (2.08)	56.59	5589	14244	8655	1:1.55
T_{12}	Endosulfan 35 EC 0.05%	2.14 (0.89)	1.46 (1.20)	1.80 (1.33)	1.94 (1.39)	1.57 (1.25)	1.75 (1.32)	86.48	1596.48	50112	48515	1:30.39
T_3	Untreated (control)	4.22 (2.05)	4.51 (2.12)	4.36 (2.08)	6.16 (2.48)	4.70 (2.16)	5.43 (2.32)	44.72				
'F' test		Sig.	Sig.	Sig.	Sig.	Sig.	Sig.					
SE (m) ±		0.25	0.25	0.15	0.21	0.13	0.12					
CD at 5 %		0.64	0.75	0.41	0.58	0.37	0.34					

Figures in parenthesis are √x transformed value DAS = Days after spraying

the another neem based treatment with spray application of neem oil 1 per cent received comparatively less ICBR of 1:6.80 which attributed due to the fact that although it had good yield potentiality, but due to increased cost of treatment. In context of the other botanicals, i.e. giripushpa leaf extract 5 per cent, garadi leaf extract 2.5 per cent and nirgudi leaf extract 5 per cent also obtain desirable ICBR to the extent of 1:10.60, 1:9.89 and 1:8.41 respectively. This could be due to better yield of tomato fruits and reduced cost of treatments. These results of the present investigations could not be corroborated with earlier workers for non availability of published literature. While, the spray application of remaining botanicals i.e. karanj oil and mahua oil each at 1 per cent was found comparatively less economically viable treatment getting ICBR of 1:5.77 and 1:3.52 due to relatively higher cost of treatment.

The treatment schedule with NSE 5% alternated with Btk at 1000 ml/ha obtained ICBR (1: 5.44) which attributed to the marginal yield level and higher cost of treatment. The another treatment schedule with NSE 5% alternated with HaNPV at 250 LE/ha received ICBR to the tune of 1 : 1.34 this was due to marginal yield potentiality and relatively more cost of treatment which is due to the higher rate of HaNPV. The treatment with microbial application of *Photorhabdus luminescens* provided the marginal ICBR of 1:1.55.The findings of the present investigation on less economical viability of the microbials could not be compared with previous workers for want of information on this aspect in the published literature.

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