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Efficacy of Entomopathogenic Fungi against Thrips on Okra

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ABSTRACT

The field experiment was conducted during Kharif season of 2013 to study the Efficacy of Entomopathogenic fungi against thrips on okra. During the course of present investigation, three entomopathogenic fungi were tested for their effect at various combinations with each other at same concentrations and compared with chemical insecticide dimethoate 30EC, with a view to find out most effective treatment (s) on thrips on okra. The experiment was conducted at P.G. Research Farm of Agril. Entomology Department, Mahatma Phule Krishi Vidyapeeth, Rahuri. The influence of different biopesticides and their combinations on thrips was studied during the investigation. Thus, the results indicated that combination of entomopathogenic fungi as V. lecanii 1.15 % WP + M. anisopliae 1.15% WP was the most effective treatment as compared to standard check dimethoate for suppression of thrips population on okra.

Key words: *Beauveria bassiana, Metarhizium anisopliae, Verticillium lecanii, thrips, okra.*

INTRODUCTION

Okra (Bhendi) *Abelmoschus esculentus* (L.) Moench is one of the most important vegetable grown throughout the tropics and warmer parts of temperate zone. It is widely cultivated as a summer season crop in North India and Maharashtra. Okra is especially valued for its tender delicious fruits in different parts of country. Though it is mainly used as a fresh vegetable, it is also consumed as canned, dehydrated and frozen forms. Dry okra seeds contain 18 to 20 per cent oil, 20 to 23 per cent crude protein and good source of iodine[4]. It has good export potential accounting for 60 per cent of fresh vegetable (Sharman and Arora[10]). Though okra finds its origin in Central Africa, India stands top in area and production. It is cultivated in an area of 5.8 lakh hectares with an annual production 63.50 lakh tones with a productivity of 12.0 Mt/ha [3]. In Maharashtra, okra cultivated in an aera of 0.22 lakh hectares with an annual production 3.28 lakh tones/ha with a productivity of 14.90 Mt/ha (Ann, 2012-13). The major okra growing states include Andhra Pradesh, Uttar Pradesh, Bihar, Orissa, Karnataka, Maharashtra and Assam[2].

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One of the most important constraints in production of okra is insect pests. As high as 72 species of insects have been recorded on crop[11] among which, the sucking pest complex consisting of aphids (*Aphis gossypii* Glover), leafhopper (*Amrasca biguttula biguttula* Ishida), whitefly (*Bemisia tabacii.* Gennadius) and Thrips (*Thrips tabaci Lindeman*) are major pest and causes 17.46 per cent yield loss in okra[4]. To tackle the pest menace, a number of chemical insecticides are liberally sprayed on this vegetable crop which leads to several problems like toxic residues, elimination of natural enemies, environmental disharmony and development of resistance. The demand is ever increasing for organically produced agricultural commodities all round the world and biological control agents have vital role to reduce the pest damage.

Okra being vegetable crop that has to be harvested at regular interval, due to customer preference for immature fruits it is critical to evaluate safer alternatives like mycopathogens and botanicals which have no toxic residues and hence are best suited for vegetable like okra. This was used fresh vegetable for consumption[1].

MATERIALS AND METHODS

The field trial was carried out at the experimental farm of Department of Agricultural Entomology, Post Graduate Institute, Mahatma Phule Krishi Vidhyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra during *Kharif* 2013-14 on variety of okra Phule Utkarsha in a randomized block design with three replications. Treatments of *B. bassiana* 1.15% WP @ 5 gm/lit, *M. anisopliae* 1.15% WP @ 5 gm/lit and *V. lecanii* 1.15% WP @ 5 gm/lit and their combinations were tested in comparison with Dimethoate 30 EC 1.5ml/lit and untreated control (Table 1). Three sprays were imposed on need basis. Observations on thrips was recorded one day before and 5, 10 and 15 days after spraying, on five randomly selected plants covering three leaves, one each from top, middle and bottom portion of the plant. The data were obtained and analysed statistically suggested by Panse and Sukhatme[8].

RESULTS AND DISCUSSION

The data on the efficacy of various biopesticides treatments on reducing thrips population after first, second and third spraying are furnished in table 1, 2 and 3, respectively. The pretreatment counts were made a day before spraying indicated that there was no significant difference among the treatments.

All the treatments were found superior in suppressing the thrips population as compared to untreated control at average of first spraying. The combination of *V. lecanii* 1.15% WP + *M. anisopliae* 1.15% WP spray in controlling thrips with survival of population 2.17 thrips/leaves/plant which was at par with the treatment *B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP + *V. lecanii* 1.15% WP recoded (2.54 thrips/leaves/plant). The dimethoate 30 EC was superior with other treatment recorded (1.40 thrips/leaves/plant). It was followed by the treatments of *M. anisopliae* 1.15% WP, *V. lecanii* 1.15% WP, *V. lecanii* 1.15% WP + *B. bassiana* 1.15% WP, *B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP and *B. bassiana* 1.15% WP was recorded population range 2.91 to 3.54 thrips/leaves/plant, (Table.1).

All the treatments were found superior in suppressing the thrips population as compared to untreated control at average of second spraying. The statistically most promosing treatment was combination of *V. lecanii* 1.15 % WP + *M. anisopliae* 1.15% WP spray in controlling thrips with survival population of 1.98 thrips/leaves/plant which was at par with the treatments *B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP +*V. lecanii* 1.15 % WP (2.47 thrips/leaves/plant) and *M. anisopliae* 1.15% WP (2.81 thrips/leaves/plant). It was followed by the treatments *V. lecanii* 1.15% WP + *B. bassiana* 1.15% WP (3.25 thrips/leaves/plant), *B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP (3.42 thrips/leaves/plant). The least significant treatment was *B. bassiana* 1.15% WP recorded 3.67 thrips/leaves/plant, (Table 2).

All the treatments were found superior in suppressing the aphid population as compared to untreated control at average of third spraying. The statistically most effective treatment was combination of *V. lecanii* 1.15 % WP + *M. anisopliae* 1.15% WP spray in controlling thrips with survival of population 2.10 thrips/ leaves/plant, which were at par with the treatments with *B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP + *V. lecanii* 1.15% WP and *M. anisopliae* 1.15% WP recorded 2.51 and 2.93 (thrips/leaves/plant), respectively. The treatment dimethoate 30 EC was superior with over other treatment recorded 0.73 thrips/leaves/plant. It was followed by the treatments *V. lecanii* 1.15 % WP (3.05 thrips/leaves/plant), *V. lecanii* 1.15% WP + *B. bassiana* 1.15% WP (3.30 thrips/leaves), *B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP (3.50 thrips/leaves/plant) and *B. bassiana* 1.15% WP (4.03 thrips/leaves/plant), (Table.3).

The present findings are in comparable with Ramarethinam who reported that the Bio-power a commercial formulation of *V. lecanii* causes 48.56 per cent mortality on *Scirtothrips dorsaslis* on chilli. Halyer[5] reported that the mortality of aphid *A.gossypii* and thrips *F.occidentalis* rape seed oil with the fungus *V. lecanii* increased efficiency upto 90 per cent.

Lopes[6] *et al*., evaluated efficiency of applications of *M. anisopliae* (strain 1104) $5x10^6$ and $1x10^8$ conidia ml^{-1} for the control of thrips in areas of hydroponic lettuce production. The number of adults per plant was observed, in comparison to initial infestation. The application of the fungus, at both concentrations, caused a 60 per cent reduction of thrips population, 6 days after the first application.

Maniania[7] *et al.* tested *M. anisopliae* against onion thrips, *T. tabaci*. *M. anisopliae* was applied at the rate of $1x10^{11}$ conidia ha^{-1} and dimethoate was applied at the recommended rate of 17.5 gm a. i. ha^{-1}. Onion bulb yield did not differ significantly among the treatments during the first season trial. However, in the second season trial, dimethoate-treated plots provided the greatest bulb yield (17 metric tons ha^{-1}) and in the third season trial, *M. anisopliae* applied weekly recorded the highest yield (24 metric tons ha^{-1}).

Table 1: Efficacy of entomopathogenic fungi against thrips on okra after first spray

Tr. No.	Treatments	Number of thrips/ leaves/plant					
		Dosage	I Spray				
		Qty/ lit.	DBS	5 DAS	10 DAS	15 DAS	Average
T1	*B. bassiana* 1.15% WP	5 gm/lit	3.61 (2.02)	3.54 (2.01)	3.30 (1.94)	3.79 (2.05)	3.54 (2.01)
T2	*M. anisopliae* 1.15% WP	5 gm/lit	3.40 (1.96)	2.88 (1.84)	2.37 (1.69)	3.48 (1.99)	2.91 (1.84)
T3	*V. lecanii* 1.15% WP	5 gm/lit	3.72 (2.04)	2.75 (1.80)	2.47 (1.75)	3.60 (2.02)	2.93 (1.86)
T4	*V. lecanii* + *M. anisopliae* 1.15% WP	5 gm/lit. each	3.60 (2.02)	2.31 (1.68)	1.86 (1.51)	2.34 (1.68)	2.17 (1.63)
T5	*B. bassiana* 1.15% WP +*M. anisopliae* 1.15 % WP	5 gm/lit. each	4.18 (2.16)	3.29 (1.94)	3.04 (1.88)	3.87 (2.09)	3.40 (1.97)
T6	*V. lecanii* 1.15% WP + *B. bassiana* 1.15% WP	5 gm/lit. each	3.58 (2.00)	2.92 (1.85)	2.91 (1.85)	3.81 (2.07)	3.21 (1.93)
T7	*B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP + *V. lecanii* 1.15% WP	5 gm/lit. each	3.51 (2.00)	2.73 (1.79)	2.08 (1.60)	2.82 (1.82)	2.54 (1.74)
T8	Dimethoate 30EC	1.5 ml/lit	3.56 (2.01)	1.54 (1.42)	0.82 (1.14)	1.84 (1.52)	1.40 (1.37)
T9	Untreated control	-	3.22 (1.92)	4.10 (2.14)	4.98 (2.34)	5.37 (2.42)	4.82 (2.31)
	SE ±	-	0.14	0.09	0.08	0.10	0.05
	CD at 5%	-	NS	0.27	0.23	0.30	0.15
	CV %	-	11.96	14.87	8.25	10.19	4.77

Figures in the parentheses are ($\sqrt{x+0.5}$) transformations, DBS-Day before spraying DAS-Days after spraying

Table 2: Efficacy of entomopathogenic fungi against thrips on okra after second spray

Tr. No.	Treatments	Number of thrips /leaves/plant				
		Dosage	II Spray			
		Qty./lit.	5 DAS	10 DAS	15 DAS	Average
T1	*B. bassiana* 1.15% WP	5 gm/lit	3.73 (2.04)	3.05 (1.88)	4.22 (2.17)	3.67 (2.03)
T2	*M. anisopliae* 1.15% WP	5 gm/lit	2.61 (1.75)	2.24 (1.65)	3.60 (2.02)	2.81 (1.82)
T3	*V. lecanii* 1.15% WP	5 gm/lit	3.10 (1.90)	2.32 (1.68)	3.80 (2.06)	3.07 (1.89)
T4	*V. lecanii* 1.15% WP + *M. anisopliae* 1.15% WP	5 gm/lit. each	1.81 (1.53)	1.71 (1.48)	2.30 (1.65)	1.98 (1.58)
T5	*B. bassiana* 1.15% WP +*M. anisopliae* 1.15 % WP	5 gm/lit. each	3.25 (1.94)	2.85 (1.83)	4.15 (2.14)	3.42 (1.98)
T6	*V. lecanii* 1.15% WP + *B. bassiana* 1.15% WP	5 gm/lit. each	3.12 (1.90)	2.85 (1.82)	3.80 (2.06)	3.25 (1.93)
T7	*B. bassiana* 1.15% WP + *M. anisopliae* + *V. lecanii* 1.15% WP	5 gm/lit. each	2.36 (1.69)	2.05 (1.59)	3.01 (1.87)	2.47 (1.72)
T8	Dimethoate 30EC	1.5 ml/lit	0.93 (1.19)	0.30 (0.88)	1.72 (1.35)	0.62 (1.05)
T9	Untreated control	-	4.06 (2.13)	5.55 (2.46)	5.34 (2.41)	4.98 (2.34)
	SE ±	-	0.07	0.09	0.10	0.08
	CD at 5%	-	0.22	0.27	0.30	0.24
	CV %	-	14.14	10.51	9.20	6.07

Figures in the parentheses are ($\sqrt{x+0.5}$) transformations, DBS-Day before spraying DAS-Days after spraying

Table 3: Efficacy of entomopathogenic fungi against thrips on okra after third spray

Tr. No.	Treatments	Number of thrips /leaves/plant					Average of three sprays
		Dosage	III Spray				
		Qty./ lit.	5 DAS	10 DAS	15 DAS	Average	
T1	*B. bassiana* 1.15% WP	5 gm/lit	4.24 (2.17)	3.85 (2.08)	4.01 (2.12)	4.03 (2.13)	3.75 (2.06)
T2	*M. anisopliae* 1.15% WP	5 gm/lit	3.12 (1.88)	2.74 (1.80)	2.93 (1.84)	2.93 (1.83)	2.93 (1.85)
T3	*V. lecanii* 1.15% WP	5 gm/lit	3.21 (1.92)	2.77 (1.83)	3.16 (1.93)	3.05 (1.88)	3.01 (1.87)
T4	*V. lecanii* + *M. anisopliae* 1.15% WP	5 gm/lit. each	1.97 (1.57)	1.89 (1.54)	2.20 (1.62)	2.10 (1.59)	2.06 (1.60)
T5	*B. bassiana* 1.15% WP +*M. anisopliae* 1.15 % WP	5 gm/lit. each	3.76 (2.05)	3.25 (1.94)	3.50 (2.00)	3.50 (2.00)	3.44 (1.98)
T6	*V. lecanii* 1.15% WP + *B. bassiana* 1.15% WP	5 gm/lit. each	3.49 (1.99)	3.05 (1.88)	3.44 (1.95)	3.30 (1.94)	3.18 (1.92)
T7	*B. bassiana* 1.15% WP + *M. anisopliae* 1.15% WP + *V. lecanii* 1.15% WP	5 gm/lit. each	2.63 (1.77)	2.21 (1.64)	2.68 (1.78)	2.51 (1.73)	2.51 (1.73)
T8	Dimethoate 30EC	1.5 ml/lit	0.21 (0.83)	0.76 (1.08)	1.23 (1.32)	0.73 (1.09)	0.92 (1.19)
T9	Untreated control	-	5.11 (2.37)	5.29 (2.41)	4.88 (2.31)	5.09 (2.36)	4.97 (2.34)
	SE ±	-	0.10	0.09	0.10	0.08	0.08
	CD at 5%	-	0.31	0.28	0.30	0.24	0.25
	CV %	-	12.72	14.12	11.31	7.38	4.48

Figures in the parentheses are ($\sqrt{x+0.5}$) transformations, DBS-Day before spraying DAS-Days after spraying

Development of Mycosis on thrips

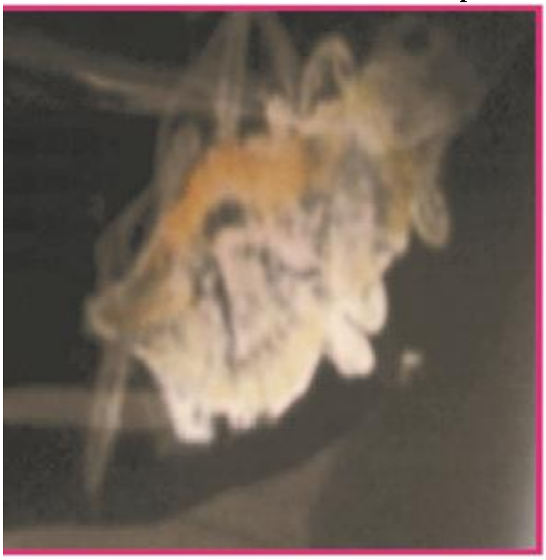

Fig: 1. Mycosis on thrips by *V.licanii*

Fig. 2. Mycosis on thrips by *B.brassiana*

CONCLUSIONS

Among the different entomopathogenic fungi treatments, the treatment *V. lecanii* 1.15 % WP + *M. anisopliae* 1.15 % WP was found to be the most effective treatment for suppression of thrips of okra.

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