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Evaluation of entomophathogenic fungi against onion thrips, *Thrips tabaci* (Lindeman)

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ABSTRACT

Different entophathogenic fungi were evaluated in field trials at the instructional farm of Agril. Entomology Section, College of Agriculture, Dhule for the management of Onion thrips *(Thrips tabaci* L.) in onion during late *Kharif* season of 2014-15. All the treatments were observed to be effective in reducing thrips infestation on onion crop. Among the evaluated insecticide and biopesticides the treatment with profenophos 50 EC was recorded significantly lowest thrips population and was at par with *Metarhizium anisopliae* 7.5 g. The next best treatments in order of their efficacy was *Verticillium lecanii* 7.5 g, *Metarhizium anisopliae* 5 g, *Metarhizium anisopliae* 2.5 g and *Verticillium lecanii* 5 g, respectively. This was followed by *Verticillium lecanii* 2.5 g, *Beauveria Bassiana* 7.5 g, *Beauveria bassiana* 5 g and *Beauveria Bassiana* 2.5 g and were found effective to control onion thrips.

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INTRODUCTION

Onion (*Allium cepa* L.) is grown all over the world and is a favorite vegetable in India. Onion is now the second most important horticultural crop after tomato in India. Major factors limiting onion production are pest such as thrips (*Thrips tabaci* Lind.) and cutworm (*Agrotis* spp) and diseases such as purple blotch (*Alternaria porri),* downy mildew (*Perenospora destructor*), leaf spot and onion smudge (*Colletotricum circinans*) (Robinowitch and Currah, 2002). Among the various pests, thrips which is a regular and potential pest of onion causes considerable losses in quality and yield (Dharmasena, 1998; Sudharma and Nair, 1999). Therefore, management of onion thrips is the vital to the production and profitability of this crop. If onion thrips are not controlled, damage can routinely reduce bulbs yield by 30 to 50 per cent (Nault and Shelton, 2010) and onion yield reductions can reach up to the levels from 34 to 50 per cent (Fournier *et al*., 1995). Thrips attacks onion crop at all stages of crops growth, but their count increases from bulb initiation and remain high upto the bulb development till to the maturity. Thrips are the major problem on this crop and the most common during warm weather (Singh *et al*., 2012). Onion thrips thrives in hot, dry condition is more damaging where these climatic conditions are prevails for most of the production season. They feed with a punch and suck behaviour that removes leaf chlorophyll causing white to silver patches and streaks. Thrips in onion are difficult to control because of succulent nature of leaves, which prevent spray solution reaching the pest due to hiding habit of thrips in central axis near the bulb (Shitole *et al.,* 2002). Onion thrips causes direct damage to crops through feeding on plants and transmission of harmful plant viruses. They are difficult to control because of their small sizes and cryptic habits (Lewis, 1997). Failure to control of this pest by timely and effective means causes considerable losses by remarkable reducing yield. most insecticides are ineffective because the large number of thrips is always protected between the inner leaves of the onion plant and the pupal stage is spent in the soil (Nault and Shelton, 2010). The repeated application of the same group of chemicals could leads to undesirable resistance, resurgence and residue problems. In the present investigation certain entophathogenic fungi were evaluated for their effectiveness against thrips on onion.

MATERIAL AND METHODS

Field trials were conducted at the instructional farm of the Agril. Entomology Section, College of Agriculture, Dhule during *late Kharif* 2014-15. The onion seedling of variety Phule Samartha was transplanted in 4th week of September. The plot size was kept as 4 m x 3 m in Randomized Block Design with 3 replications. The eleven treatments evaluated were profenophos 50 EC 1 ml, *M. anisopliae* 2.5 g, *V. lecanii* 2.5 g, *B. bassiana* 2.5 g, *M. anisopliae* 5 g, *V. lecanii* 5 g, *B. bassiana* 5 g, *M. anisopliae* 7.5 g, *V. lecanii* 7.5 g, *B. bassiana* 7.5 g per litre. The application of treatments was made at ETL of the thrips and a total of 3 sprays were given at 10 days interval. All other agronomical practices were performed as per recommendation in all the treatments. The data on thrips populations (thrips/plant) were recorded a day before first spraying and 5th and 10th days after each spray. The data was analyzed statistically and presented in Table 1.

RESULTS AND DISCUSSION

The data presented in Table 1 revealed that before first spray thrips population ranged from 17.06 to 22.73 thrips/plant and difference among various treatments was statistically non-significant indicates homogenous pest distribution all over the field. After first spray.

The data presented in Table 1 revealed that after five days of imposing the treatments the pest population ranged from 11.63 to 22.23 thrips/plant as against 22.23 thrips/plant in untreated control.

The treatment profenophos 50 EC was recorded significantly lowest thrips population (11.63 thrips/plant) and was found at par with *M. anisopliae* 7.5 g in which (15 thrips/plant) was observed. The next best treatments in order of their efficacy was of *V. lecanii* 7.5 g (15.53 thrips/plant) and was at par with *B. bassiana* 7.5 g, *V. lecanii* 2.5 g, *B. bassiana* 5 g, *M. anisopliae* 5 g, *M. anisopliae* 2.5 g and *V. lecanii* 5 g which recorded, 17.9, 18.33, 18.23, 18.9, 19.06 and 19.33 thrips/plant, respectively and were significantly superior over untreated control.

The survival population of thrips at ten days after first spraying in all the treatments was significantly superior over untreated control except *B. bassiana* 2.5 g and *B. bassiana* 5 g. The average survival population of thrips per plant ranged from 12.3 to 18.46 in treated plot as against 21.5 thrips/plant in untreated control. The treatment profenophos 50 EC was recorded significantly lowest thrips population (12.3 thrips/plant) and was at par with *M. anisopliae* 7.5 g and *V. lecanii* 7.5 g in which 14.13, 14.76 thrips/plant, respectively was observed. The next best treatments in order of their efficacy was *B. bassiana* 7.5 g and was at par with *V. lecanii* 2.5 g, *M. anisopliae* 5 g, *M. anisopliae* 2.5 g and *V. lecanii* 5 g which recorded, 16.26, 16.75, 17.36, 17.33, and 17.36 thrips/plant, respectively and were significantly superior over untreated control.

After second spray :

The data presented in Table 1 revealed that survival population of thrips at five days after second spraying in all the treatments were significantly superior over untreated control except *B. bassiana* 2.5 g, *B. bassiana* 5 g. The average survival population of thrips per plant ranged from 9.23 to 17.7 thrips/plant in treated plot as against 20.4 thrips/plant in untreated control. The treatment profenophos 50 EC was recorded significantly lowest thrips population (9.23 thrips/plant) and was significantly superior over all the treatments.

The next best treatments in order of their efficacy was *M. anisopliae* 7.5 g (12.76) and was at par with *V. lecanii* 7.5 g, *B. bassiana* 7.5 g and *M. anisopliae* 2.5 g which recorded 13.56, 14.9 and 15.63 thrips/plant, respectively followed by *M. anisopliae* 5 g, *V. lecanii* 5 g and *V. lecanii* 2.5 g which recorded, 15.7, 15.66 and 16.66 thrips/plant, respectively and was found effective in reducing thrips population and significantly superior over untreated control.

The survival population of thrips at ten days after second spraying was significantly superior over untreated control and the average survival population of thrips per plant ranged from 3 to 6 as against 15.66 in untreated control. The treatment profenophos 50 EC was recording significantly lowest thrips population (3 thrips/plant) and was at par with *M. anisopliae* 7.5 g, *M. anisopliae* 5 g, and *M. anisopliae* 2.5 g recording 3.4, 3.53 and 4 thrips/plant, respectively. The next best treatments in order of their efficacy was *V. lecanii* 7.5 g, *B. bassiana* 5 g, *V. lecanii* 5 g, *V. lecanii* 2.5 g, *B. bassiana* 2.5 g and *B. bassiana* 7.5 g which recorded 4.53, 4.73, 4.86, 5, 5.4 and 6 thrips/plant, respectively and was found effective in controlling thrips population and significantly superior over untreated control. The overall reduction in thrips population was due to the rainfall and humid climate.

After third spray :

It is observed from the data presented in Table 1 that survival population of thrips at five days after third spraying was significantly superior over untreated control and the average survival population of thrips per plant ranged from 2.5 to 5.1 in treated plot as against 14.83 in untreated control. The treatment profenophos 50 EC was recorded significantly lowest thrips population (2.5 thrips/ plant) and was at par with *M. anisopliae* 7.5 g, *M. anisopliae* 2.5 g, *V. lecanii* 5 g and *M. anisopliae* 5 g

Table 1 : Evaluation of entomopathogenic fungi against onion thrips

Sr. No.	Name of the treatment	Dose / gm Or ml/lit	Pre Count	Average no. of thrips per plant						
				I Spray		II Spray		III Spray		Cummulative
				5 DAS	10 DAS	5 DAS	10 DAS	5 DAS	10 DAS	Mean
1.	*Metarhizium anisopliae* WP	2.5 g	21.4	19.06	17.33	15.63	4.00	3.66	3.93	10.60
	(1x 10^8CFU/ml)		(4.67)	(4.42)	(4.22)	(4.00)	(2.12)	(2.04)	(2.09)	(3.33)
2.	*Verticillium lecanii* WP (1x	2.5 g	19.2	18.33	16.79	16.66	5.00	4.26	4.4	10.91
	10^8CFU/ml)		(4.40)	(4.32)	(4.14)	(4.13)	(2.34)	(2.17)	(2.21)	(3.21)
3.	*Beauveria bassiana* WP (1x	2.5 g	20.26	19.23	18.46	17.7	6.00	5.1	5.9	12.06
	10^8CFU/ml)		(4.55)	(4.44)	(4.35)	(4.27)	(2.54)	(2.37)	(2.52)	(3.54)
4.	*Metarhizium anisopliae* WP	5 g	19.13	18.9	16.93	15.7	3.53	3.4	3.73	10.23
	(1x 10^8CFU/ml)		(4.42)	(4.40)	(4.17)	(4.02)	(1.99)	(1.95)	(2.05)	(3.28)
5.	*Verticillium lecanii* WP (1x	5 g	22.73	19.33	17.36	15.66	4.86	4.2	4.33	11.62
	10^8CFU/ml)		(4.82)	(4.45)	(4.23)	(4.02)	(2.31)	(2.16)	(2.20)	(3.48)
6.	*Beauveria bassiana* WP (1x	5 g	19.2	18.23	18.36	17.4	5.4	4.93	5.4	11.27
	10^8CFU/ml)		(4.43)	(4.40)	(4.34)	(4.23)	(2.42)	(2.23)	(2.42)	(3.28)
7.	*Metarhizium anisopliae* WP	7.5 g	17.06	15.00	14.13	12.76	3.4	2.53	3.7	8.59
	(1x 10^8CFU/ml)		(4.18)	(3.93)	(3.82)	(3.64)	(1.97)	(1.73)	(2.04)	(2.86)
8.	*Verticillium lecanii* WP (1x	7.5 g	17.2	15.53	14.76	13.56	4.53	3.53	4.3	9.37
	10^8CFU/ml)		(4.19)	(4.00)	(3.90)	(3.75)	(2.24)	(2.01)	(2.18)	(3.01)
9.	*Beauveria bassiana* WP (1x	7.5 g	18.93	17.9	16.26	14.9	4.73	4.46	4.47	10.45
	10^8CFU/ml)		(4.40)	(4.28)	(4.09)	(3.92)	(2.29)	(2.37)	(2.23)	(3.31)
10.	Profenophos 50 EC 0.05 %	1 ml	18.46	11.63	12.3	9.23	3.00	2.5	3.46	7.02
			(4.35)	(3.47)	(3.56)	(3.12)	(1.87)	(1.73)	(1.99)	(2.62)
11.	Untreated control	-	19.2	22.23	21.5	20.4	15.66	14.83	16.4	18.50
			(4.41)	(4.75)	(4.69)	(4.57)	(4.02)	(3.91)	(4.11)	(4.34)
	S.E. ±		0.218	0.175	0.143	0.126	0.090	0.128	0.114	0.099
	C.D. (P=0.05)		NS	0.516	0.422	0.374	0.266	0.377	0.336	0.282

* Figure in parenthesis denote $\sqrt{x + 0.5}$ transformed value * NS =Non-significant

which recorded 2.53, 3.4, 3.53 and 3.66 thrips/plant, respectively. The next best treatments in order of efficacy was, *V. lecanii* 5 g and was at par with *V. lecanii* 2.5 g, *B. bassiana* 5 g, *B. bassiana* 2.5 g and *B. bassiana* 7.5 g which recorded 4.2, 4.26, 4.46, 4.93 and 5.1 thrips/ plant, respectively and was found effective in recording thrips population and significantly superior over untreated control.

It is observed from the data presented in Table 1 that survival population of thrips at ten days after third spraying was significantly superior over untreated control and the average survival population of thrips per plant ranged from 3.46 to 5.9 intreated plot as against 16.4 in untreated control. The treatment profenophos 50 EC was recorded significantly lowest thrips population (3.46 thrips/plant) and was at par with *M. anisopliae* 7.5 g, *M. anisopliae* 5 g, *M. anisopliae* 2.5 g, *V. lecanii* 7.5 g, *V. lecanii* 5 g, *V. lecanii* 2.5 g and *B. bassiana* 5 g which recorded 3.7, 3.73, 3.93, 4.3, 4.33 and 4.4 thrips/ plant, respectively and was found effective in reducing thrips population and significantly superior over untreated control.

The general trend of field efficacy of the treatments under study against onion thrips indicated as profenophos 50 EC > *M. anisopliae* 7.5 g > *V. leccaani* 7.5 g > *M. anisopliae* 5 g > *M. anisopliae* 2.5 g > *V. lecanii* 5 g > *V. lecanii* 2.5 g > *B. bassiana* 7.5 g > *B. bassiana* 5 g > *B. bassiana* 2.5 g.

Patil *et al*. (2010) conducted experiment to determine the effective and economical control measure for the management of onion thrips (*Thrips tabaci*), for which ten new insecticides and biopesticides were tested, *i.e. B. bassiana* at 4 g/lit, *V. lecanni* 2×10^8 CFU at 5 g/ lit and reported that all treatments can effective control of onion thrips. Which are in confirmation with present investigations.

Singh *et al*. (2012) reported that among the treatments the highest efficacy was recorded with profenofos at the rate of 1 ml/lit followed by *B. bassiana* at the rate of 10^{13} spores/ha, are in confirmation with present investigation.

Tripathy *et al*. (2013) revealed that the treatments profenophos 1 ml/lit was the best treatment caused 68.6 per cent reduction in thrips population followed by entophathogenic fungi 42.7 per cent, are in confirmation with present investigation.

Wayal (2008) reported that the bio-pesticides *Veticillium lecanii* @ 4 g/lit are most effective for the control of onion thrips. In present investigation among various entophathogenic fungi *M. anisopliae* was superior over *V. lecanii* and *B. bassiana.*

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