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Efficacy of entomopathogenic fungi for the management of onion thrips, *Thrips tabaci* Lind.

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ABSTRACT : Different entomopathogens and insecticides were tested in field trials at Regional Research Station Salaru, Karnal (Haryana) for the management of Onion thrips (*Thrips tabaci* L.) in onion during *Rabi* season of 2006-07, 2007-08 and 2008-09. Significantly lowest thrips papulation (17.0 nymph/ plant) were recorded with deltamethrin 2.8 EC (0.095%) and it was found to be at par with spinosad 45 SC (0.1%) at 7 days after last spray. The entomopathogenic fungus was less effective compared to chemical insecticide but among the entomopathogenic fungi *Beauveria bassiana* performed better in respect of reducing thrips population as well as increasing yield. Significantly highest gross yield (277 q/ha) was recorded with deltamethrin 2.8 EC. However, among entomopathogenic fungi highest gross yield (226 q/ha) was recorded with *B. bassiana*. The highest benefit cost ratio (46.75) was recorded with deltamethrin 2.8 EC followed by *B. bassiana.* at the rate of 0.4 percent (20.20).

Keywords : Entomopathogenic fungus, onion, *Thrips tabaci*

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important vegetable crops grown in almost all parts of the India. The onion thrips, *Thrips tabaci* Lindeman is an important pest of onion crop around the world. It attacks onion at all the stages of crop growth, but their number increases from bulb initiation and remain high up to bulb development and maturity. Both nymphs and adults cause direct damage by puncturing the epidermis of the leaves and suck out sap with modified piercing and sucking mouth parts. It causes damage directly through feeding and indirectly through the transmission of lethal plant viruses. It is difficult to control this pest with insecticides because of its small size and cryptic habits (Lewis 1997). Failure to control this pest by timely and effective means causes yield loss up to 50 percent (Juan Anciso, 2002). Mostly insecticides are used for the control of thrips, but now they are reported ineffective and providing moderate control. To avoid further resistance in this pest different entomologist tried different non chemical methods. Entomopathogenic fungi are currently being investigated for the control of many important insect pest of various crop around the world, and some are commercially available. Fungal bioagents have been used for the control of crop pests in India *viz. Verticillium lecanii* on *Coccus viridis, Beauveria* on *Spodoptera litura* (Jayaraj 1986). *Beauveria bassian*a is effective against white fly and other insects (Maddox 1994).In laboratory studies, *T. tabaci* was susceptible to *Verticillium lecanii*, *Beauveria bassian*a, *Metarhizium anisopliae* and *Paecilomyces fumosoroseus* (Gillespie 1986, Fransen 1990).Vestergaard *et al.* (1995) and Brownbridge (1995) showed that *B. bassian*a, *M. anisopliae* and *V.lecanii were more active against the western flower thrips ,Frankliniella occidentalis* than *P. fumosoroseus* . The present study a step forward in this direction to assess the effect of entomopathogenic fungus for the management of thrips in onion.

MATERIALS AND METHODS

Field trials were conducted at National Horticulture Research and Development Foundation Regional Research Station Salaru, Karnal during *Rabi* 2006-07, 2007-08 and 2008-09. The onion seedling of variety Agrifound Light Red (ALR) was transplanted is 1st week of January. The plot size was kept as 3.6 m X 1.8 m in Randomized Block Design with 3 replications. The treatments evaluated were *Verticillium lecanii* at the rate of 0.4 percent, spinosad 45 percent SC at the rate of

0.1 percent, *Metarhizium anisopliae* at the rate of 0.5 percent, *Paecilomyces fumosoroseus* at the rate of 0.4 percent, *Beauveria bassiana* at the rate of 0.4 percent and deltamethrin 2.8 percent EC at the rate of 0.095 percent used as check treatment. The application of treatments were started at appearance of the thrips and a total of 6 sprays were given at 7 days interval except check treatment, where only 4 sprays were given at 15 days interval. Sticker at the rate of 0.06 percent was invariably mixed in each spray solution as sticky agent. All other agronomical practices were performed as per need in all the treatments. The data were on thrips populations (no. of nymphs/plant) were recorded a day before and seven days after each spray. The cost benefit ratio was also worked out and data of three consecutive years i.e. 2006-07, 2007-08, 2008-09 and pooled data of three year were analyzed statistically and presented in Table-1,2,3 and 4.

RESULTS AND DISCUSSION

The data presented in Table 1 revealed that before first spray thrips population ranged from 2.0 to 3.0 nymph /plant. During the all observations significantly lowest thrips population was recorded in deltamethrin at the rate of 0.095 % fallowed by spinosad 45 percent SC at the rate of 0.1 percent sprayed plot. In among the entomopathogenic fungus significantly lowest thrips population (41.0 nymph /plant) was recorded in *B. bassiana* at the rate of 0.4 percent fallowed by *V. lecanii* at the rate of 0.4 percent (48.0 nymph /plant) at seven day after sixth spray. Highest thrips population was recorded in absolute control plot. The data further revealed that significantly highest gross yield (296.0q/ha) was recorded in deltamethrin at the rate of 0.095 percent sprayed plot compared to only 142.0 q/ha in absolute control plot.

Presented in Table 2 revealed that during all the observations, significantly lowest thrips population were recorded in deltamethrinat (0.095%) sprayed plot which was found at par with spinosad except before 3rd spray. While before 3rd spray significantly lowest thrips population (5.0 nymphs/plant) was recorded in spinosad 45 SC sprayed plot which was found at par with deltamethrin (7.0 nymphs/plant), *Verticillium lecanii* at the rate of 0.4 percent (9.0 nymphs/plant) and *Beauveria bassiana* at the rate of 0.4 percent (9.0 nymphs/plant) sprayed plot. In among the entomopathogenic fungus significantly lowest thrips population (36.0 thrips /plant) was recorded in *B. bassiana* at the rate of 0.4 percent and it was found to be at par with *V. lecanii* at the rate of 0.4 percent (34.0 thrips /plant) at seven day after sixth spray. The significantly highest gross yield (271.0q/ha) was recorded in deltamethrinat the rate of 0.095 percent followed by spinosad 45 percent SC at the rate of 0.1 percent (259.53 q/ha) sprayed plot compared to only 135.0 q/ha in absolute control plot.

Data presented in Table 3 revealed that before spray thrips population ranged from 0 to 1 nymphs/plant. During all the observational period before each spray up to 7 days after last spray significantly lowest thrips population were recorded in Deltamethrin at the rate of 0.095 percent which was found at par with spinosad 45 percent SC at the rate of 1ml/lit before 2nd, 3rd, 4th and 6th spray, *Beauveria bassiana* at the rate of 0.4 percent at before 2nd and 6th spray and *Verticillium lecanii* at the rate of 0.4 percent at before 2nd spray. In among the entomopathogenic fungus significantly lowest thrips population (28.0 thrips /plant) was recorded in *B. bassiana* at the rate of 0.4% and it was found to be at par with *V. lecanii* at the rate of 0.4 percent (30.0 thrips /plant) at seven day after sixth spray.The data further revealed that significantly highest gross yield (262 q/ha) was recorded in deltamethrin (0.095%) and which was at par with spinosad 1ml/l (246q/ha).

The pooled data of three year are presented in table-4, which revealed that before 1st spray, thrips population did not differ significantly in all the treatments. The thrips population was significantly lowest in the treatment deltamethrin 2.8 percent EC at the rate of 0.095 percent (check treatment) and found to be at par with spinosad 45 percent SC at the rate of 0.1 percent at before each spray and 7 days after last spray. The findings of present studies are in conformity with the results obtained by Pawar *et al*. (1994) for control of thrips in onion up to 8 days with synthetic pyrethroids, fenpropathrin and deltamethrin. Lazano and kilchher (1998) reported that spinosad may also be use full in controlling thrips in field conditions. After seven days of 6th spray all the entomopathogenic fungi reduced the thrips population significantly compared to control (72.0 thrips /plant). Among the entomopathogenic fungi significantly lowest thrips population (33.0 thrips /plant) was recorded in *B. bassiana* at the rate of 0.4 percent and it was found at par with *V. lecanii* at the rate of 0.4 percent (37.0 thrips /plant) .These result are supported by the findings of Metcalf *et.al* (1962) reported that spray formulation of the *B. bassiana* are also usefull for thrips control and Brownbridge(1995) reported that *B. bassiana, M.anisopliae* and *V. lecanii* were more active against the western flower thrips, *Frankliniella occidentalis* than *Paccilomyces farinosus.* Spray of water+stecker they

Table 1. Effect of entomopathogenic fungi on onion thrips during 2006-07

Treatments	Thrips population (nymphs/plant) before spray							Gross Yield (q/ha)
	1st spray	2st spray	3rd spray	4rd spray	5th spray	6th spray	7day after 6th spray	
Verticillium lecanii @ 0.4%	3	11	20	28	40	51	48	336
Spinosad 45 SC @ 0.1%	3	6	14	21	25	36	34	402
Metarhizium anisopliae @ 0.5%	2	10	21	29	38	52	50	336
Paecilomyces fumosoroseus @ 0.4%	3	10	22	32	41	48	51	344
Beauveria bassiana @ 0.4%	3	8	16	24	30	43	41	328
Deltamethrin 2.8 EC @ 0.095% (check)	3	5	11	13	19	25	27	398
Control (water + sticker)	3	25	57	76	76	92	89	331
Absolute control (No spray)	3	27	58	78	84	95	90	284
CD at 5%	NS	4	4	7	4	5	3	38

Table 2. Effect of entomopathogenic fungus for the control of onion thrips during 2007-08

Treatments	Thrips population (nymphs/plant) before spray							Gross Yield (q/ha)
	1st spray	2st spray	3rd spray	4rd spray	5th spray	6th spray	7 day after 6th spray	
Verticillium lecanii @ 0.4%	2	4	9	19	23	28	34	218
Spinosad 45 SC @ 0.1%	3	2	5	7	9	9	12	260
Metarhizium anisopliae @ 0.5%	3	6	11	21	28	33	39	216
Paecilomyces fumosoroseus @ 0.4%	3	6	14	27	31	36	43	214
Beauveria bassiana @ 0.4%	3	3	9	15	22	25	30	220
Deltamethrin 2.8 EC @ 0.095% (check)	3	2	7	4	6	4	8	271
Control (water + sticker)	3	7	29	42	48	56	67	136
Absolute control (No spray)	3	8	33	45	52	60	72	135
CD at 5%	NS	2	4	7	10	6	6	4

Table 3. Effect of entomopathogenic fungi on onion thrips during 2008-09

Treatments	Thrips population (nymphs/plant) before spray							Gross Yield (q/ha)
	1st spray	2st spray	3rd spray	4rd spray	5th spray	6th spray	7 day after 6th spray	
Verticillium lecanii @ 0.4%	1	4	10	30	12	13	30	196
Spinosad 45 SC @ 0.1%	1	2	5	4	6	7	7	246
Metarhizium anisopliae @ 0.5%	1	5	8	37	26	18	35	222
Paecilomyces fumosoroseus @ 0.4%	0	7	12	42	18	22	40	209
Beauveria bassiana @ 0.4%	0	3	9	22	15	11	28	206
Deltamethrin 2.8 EC @ 0.095% (check)	1	2	4	2	1	1	1	262
Control (water + sticker)	1	6	23	61	33	43	48	181
Absolute control (No spray)	1	7	26	64	33	47	53	161
CD at 5%	NS	2	2	6	2	10	5	31

Table 4. Effect of entomopathogenic fungi on onion thrips (Pooled data 2006-07, 2007-08 and 2008-09)

Treatments	Thrips population (nymphs/plant) before spray							Gross Yield (q/ha)	Benefit Cost ratio
	1st spray	2st spray	3rd spray	4rd spray	5th spray	6th spray	7 day after 6th spray		
Verticillium lecanii @ 0.4%	2	6	13	26	25	31	37	215	17.27
Spinosad 45% SC @ 0.1%	2	4	8	11	13	17	17	255	1.53
Metarhizium anisopliae @ 0.5%	2	7	13	29	31	35	41	221	15.88
Paecilomyces fumosoroseus @ 0.4%	2	8	16	34	30	35	45	215	17.39
Beauveria bassiana @ 0.4%	2	5	11	20	22	26	33	226	20.20
Deltamethrin 2.8% EC @ 0.095% (check)	2	3	7	7	9	10	12	277	46.75
Control (water + sticker)	2	13	36	59	52	64	68	155	9.87
Absolute control (No spray)	2	14	39	62	56	67	72	146	-
CD at 5%	NS	3	4	6	7	7	5	20	-

did not reduce the thrips population significantly as compared to no spray (Absolute control) in all the observational period.

The data further revealed that significantly highest gross yield (277 q/ha) was recorded with deltamethrin 2.8 EC at the rate of 0.095 percent fallowed by spinosad 45 percent SC at the rate of 0.1 percent (255 q/ha). Among the entomopathogenic fungi highest gross yield (226 q/ha) was recorded in *B. bassiana* at the rate of 0.4 percent and found at par with *M. anisopliae at the rate of 0.5* percent (221q/ha), *V. lecanii* at the rate of 0.4 percent (215q/hq) and *P. fumosoroseus* at the rate of 0.4 percent, (215q/ha). Significantly more yield was recorded in all treatment than absolute control (146q/ha) except control (155q/ha). The highest cost benefit ratio (1:46.75) was recorded in deltamethrin 2.8 percent EC at the rate of 0.095 percent fallowed by *B. bassiana* at the rate of 0.4 percent (1:20.20). The cost benefit ratio (1:1.53) was recorded in spinosad 45 percent SC at the rate of 0.1 percent, because the higher cost of spinosad. Based on above findings, the present study thus suggests that four spray of deltamethrin 2.8 percent EC at the rate of 0.095 percent at 15 days interval effective for managing thrips population as well as highest cost benefit ratio and gave good yield. The entomopathogenic fungi were less effective as compared to chemical insecticide but *B. bassiana* performed better in respect of reducing thrips population, increasing bulb yield and highest benefit cost ratio.

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