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Research Note

Efficacy of biocontrol agents in the management of onion thrips, *Thrips tabaci* (Lind.) on onion

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ABSTRACT: Application of *Beauveria bassiana* (Bals) @ 1x 10^9 spores/ml twice was found to be best treatment with lowest mean thrips population (9.53/plant) with highest per cent reduction (64.15) followed by *Verticillium lecanii* (Zimmerman) @ 1x10^9 spores/ml (20 and 30 DAP) with 49.89 per cent reduction. *Chrysoperla zastrowi* sillemi 20,000 /ac (20 DAP) + *B. bassiana* @ 1x10^9 spores/ml (30 DAP) with 41.50 per cent reduction was found to be next best treatment. The treatment with *C. z.* sillemi @ 20,000 /ac (20 and 30 DAP) was least effective treatment with lowest per cent reduction (28.59).

KEY WORDS: *Chrysoperla zastrowi sillemi*, *Beauveria bassiana,* onion, thrips, *Verticillium lecanii*

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Onion, *Allium cepa* L., is a common and important commercial vegetable belong to family Lilliacae. Onion thrips, *Thrips tabaci* Lind. is serious pest inflicting 34 – 43 per cent loss in yield (Krishna Kumar *et al.,* 2001). Failure to control thrips by timely and effective means causes considerable damage and results in immense economic yield losses to the tune of 50 per cent (Anonymous, 2000). Even 90 per cent loss in yield has also been reported on onion when thrips attack the crop in early stages of crop growth (Anonymous, 1984). Both nymph and adults cause direct damage by puncturing epidermis of the leaves and suck the sap. Numerous white patches are formed on infested leaves (Srinivas *et al.,* 2006).

Farmers extensively use insecticides for controlling thrips which results in mortality of natural enemies, outbreak of secondary pests and development of insecticide resistance (Shitole *et al.,* 2002). Biological control could be a safe option for the management of thrips. Hence, the present investigation was undertaken to evaluate the field performance of different biological control agents against *T. tabaci* infesting onion.

Field experiments were conducted during June 2009 – September 2010 at Zonal Agricultural Research Station, Hiriyur (first season) and M. D. Kote (second and third seasons) to evaluate the bio control agents against onion thrips. The experiment was carried out with randomized block design with three replications and seven treatments. Bio-control treatments (*C. zastrowi*, *B. bassiana* and *V. lecanii*) were imposed 20 and 30 days after planting when the pest population was at its peak. Dimethoate 30 EC @ 1.7 ml/l was used as check. The observations on the thrips population was recorded at 30 to 44 DAP at seven days intervals on ten plants selected at random. All leaves on each plant were examined under 10X hand lens for the presence of thrips and the population was expressed as No. of thrips/plant.

The data on the effect of various biocontrol agents against thrips on 30, 37 & 44 DAP under field conditions are presented in Table 1.

On 30 DAP, the treatment *Beauveria bassiana* recorded the lowest population (6.86 thrips/plant) with highest per cent reduction (67.47 over control). This treatment was significantly superior to other treatments. This was followed by two applications of *Verticillium lecanii* (10.43/plant) with 50.55 per cent reduction. The highest population of (14.85/plant) with lowest 29.59 per cent reduction was found in the treatment with two releases of *C. z.* sillemi eggs/grubs @ 20,000 / ac (20 and 30 DAP) (Table 1).

Table 1. Evaluation of various biocontrol agents against *Thrips tabaci* population (First season)

Sl. No.	Treatments	*T. tabaci* (No./plant)								
		Precount	30 DAP	% reduction over control	37 DAP	% reduction over control	44 DAP	% reduction over control	Mean	% reduction over control
1.	*Chrysoperla Z. sillemi* 20,000 /ac (20 and 30 DAP)	19.34	14.85 (3.92)e	29.59	17.43 (4.23)^{e}	28.62	21.33 (4.67)^{d}	28.04	17.87 (4.29)^{e}	28.66
2.	*Beauveria bassiana* 1x10^{9} spores/ml (20 and 30 DAP)	22.65	6.86 (2.71)a	67.47	8.36 (2.98)^{a}	65.77	11.54 (3.47)^{a}	61.07	8.92 (3.07)^{a}	64.39
3.	*Verticillium lecanii* 1x10^{9} spores/ml (20 and 30 DAP)	18.34	10.43 (3.31)c	50.55	12.26 (3.57)^{c}	49.80	15.11 (3.95)^{b}	49.02	12.60 (3.62)^{c}	49.70
4.	*C. Z. sillemi* 20,000 /ac (20 DAP) + *B. bassiana* 1x10^{9} spores/ml (30 DAP)	20.28	12.24 (3.57)d	41.96	14.34 (3.85)^{d}	41.28	17.63 (4.26)^{c}	40.52	14.74 (3.90)^{d}	41.16
5.	*C. Z. sillemi* 20,000 /ac (20 DAP) + *V. lecanii* 1x10^{9} spores/ml (30 DAP)	19.34	14.56 (3.88)^{e}	30.96	16.93 (4.17)^{e}	30.67	20.87 (4.62)^{d}	29.59	17.45 (4.24)^{e}	30.34
6.	Dimethoate 30 EC @ 1.7 ml/l	23.46	8.36 (2.98)b	60.36	9.92 (3.23)^{b}	59.38	12.26 (3.57)^{a}	58.64	10.18 (3.27)^{b}	59.36
7.	Control	18.67	21.09 (4.65)^{f}	0.00	24.42 (4.99)^{f}	0.00	29.64 (5.49)^{e}	0.00	25.05 (5.05)^{f}	0.00 0.00
	SEm±	NS	0.062		0.066		0.042		0.050	
	CD (P = 0.05)		0.191		0.203		0.130		0.156	

Values in parentheses are square root transformations

In a column, means followed by same letter(s) are not significantly different at P = 0.05 as per DMRT, DAP (Days after planting)

Table 2. Evaluation of various biocontrol agents against *Thrips tabaci* population (Second season)

Sl. No.	Treatments	*T. tabaci* (No./plant)								
		Precount	30 DAP	% reduction over control	37 DAP	% reduction over control	44 DAP	% reduction over control	Mean	% reduction over control
1.	*Chrysoperla z. sillemi* 20,000 /ac (20 and 30 DAP)	21.49	13.16 (3.70)^{d}	31.95	16.16 (4.08)^{e}	30.67	20.93 (4.63)^{e}	29.39	16.75 (4.15)^{e}	30.50
2.	*Beauveria bassiana* 1x10^{9} spores/ml (20 and 30 DAP)	21.39	7.01 (2.74)^{a}	63.75	7.73 (2.87)^{a}	66.84	10.86 (3.37)^{a}	63.36	8.53 (3.00)^{a}	64.61
3.	*Verticillium lecanii* 1x10^{9} spores/ml (20 and 30 DAP)	17.24	9.13 (3.10)^{b}	52.79	11.24 (3.43)^{c}	51.84	14.76 (3.91)^{c}	50.20	11.71 (3.49)^{c}	51.41
4.	*C. z. sillemi* 20,000 /ac (20 DAP) + *B. bassiana* 1x10^{9} spores/ml (30 DAP)	22.34	10.81 (3.36)^{c}	44.11	13.23 (3.71)^{d}	43.24	17.13 (4.20)^{d}	42.21	13.72 (3.77)^{d}	43.07
5.	*C. z. sillemi* 20,000 /ac (20 DAP) + *V. lecanii* 1x10^{9} spores/ml (30 DAP)	18.24	12.93 (3.66)^{d}	33.14	15.84 (4.04)^{e}	32.05	20.32 (4.56)^{e}	31.44	16.36 (4.11)^{e}	32.12
6.	Dimethoate 30 EC @ 1.7 ml/l	17.86	7.02 (2.74)^{a}	63.70	8.81 (3.05)^{b}	62.21	11.45 (3.46)^{b}	61.37	9.09 (3.10)^{b}	62.28
7.	Control	17.63	19.34 (4.45)^{e}	0.00	23.31 (4.88)^{f}	0.00	29.64 (5.49)^{f}	0.00	24.10 (4.96)^{f}	0.00
	SEm±	NS	0.049		0.052		0.029		0.020	
	CD (P = 0.05)		0.150		0.160		0.091		0.062	

Values in parentheses are square root transformations

In a column, means followed by same letter(s) are not significantly different at P = 0.05 as per DMRT, DAP (Days after planting)

Table 3. Evaluation of various biocontrol agents against *Thrips tabaci* population (Third season)

Sl. No.	Treatments	*T. tabaci* (No./plant)								
		Precount	30 DAP	% reduction over control	37 DAP	% reduction over control	44 DAP	% reduction over control	Mean	% reduction over control
1.	*Chrysoperla z. sillemi* 20,000 /ac (20 and 30 DAP)	26.82	18.28 (4.33)^{d}	28.12	21.35 (4.67)^{e}	27.03	27.35 (5.28)^{e}	26.36	22.33 (4.78)^{e}	27.05
2.	*Beauveria bassiana* 1x10^{9} spores/ml (20 and 30 DAP)	22.48	8.84 (3.05)^{a}	65.24	10.62 (3.33)^{a}	63.70	13.96 (3.80)^{a}	62.41	11.14 (3.41)^{a}	63.61
3.	*Verticillium lecanii* 1x10^{9} spores/ml (20 and 30 DAP)	24.63	12.78 (3.64)^{b}	49.74	14.96 (3.93)^{c}	48.87	19.24 (4.44)^{c}	48.20	15.66 (4.02)^{c}	48.84
4.	*C. z. sillemi* 20,000 /ac (20 DAP) + *B. bassiana* 1x10^{9} spores/ml (30 DAP)	28.64	15.12 (3.95)^{c}	40.54	17.73 (4.27)^{d}	39.41	21.72 (4.71)^{d}	41.52	18.19 (4.32)^{d}	40.57
5.	*C. z. sillemi* 20,000 /ac (20 DAP) + *V. lecanii* 1x10^{9} spores/ml (30 DAP)	26.34	17.92 (4.29)^{d}	29.53	20.85 (4.62)^{e}	28.74	26.83 (5.23)^{e}	27.76	21.87 (4.73)^{e}	28.55
6.	Dimethoate 30 EC @ 1.7 ml/l	22.65	9.76 (3.20)^{a}	6162	11.61 (3.48)^{b}	60.32	15.14 (3.95)^{b}	59.24	12.17 (3.56)^{b}	60.24
7.	Control	23.49	25.43 (5.09)^{e}	0.00	29.26 (5.46)^{f}	0.00	37.14 (6.14)^{f}	0.00	30.61 (5.58)^{f}	
	SEm±	NS	0.052		0.029		0.027		0.017	
	CD ($P = 0.05$)		0.161		0.091		0.083		0.052	

Values in parentheses are square root transformations

In a column, means followed by same letter(s) are not significantly different at $P = 0.05$ as per DMRT, DAP (Days after planting)

Table 4. Evaluation of various biocontrol agents against *Thrips tabaci* population (Pooled)

Sl. No.	Treatments	*T. tabaci* (No./plant)								
		Precount	30 DAP	% reduction over control	37 DAP	% reduction over control	44 DAP	% reduction over control	Mean	% reduction over control
1.	*Chrysoperla z. sillemi* 20,000 /ac (20 and 30 DAP)	22.55	15.43 (3.99)[d]	29.70	18.31 (4.34)[e]	28.64	23.20 (4.87)[e]	27.82	18.98 (4.41)[e]	28.59
2.	*Beauveria bassiana* 1x10[9] spores/ml (20 and 30 DAP)	22.17	7.57 (2.84)[a]	65.51	8.90 (3.07)[a]	65.32	12.12 (3.55)[a]	62.29	9.53 (3.17)[a]	64.15
3.	*Verticillium lecanii* 1x10[9] spores/ml (20 and 30 DAP)	20.07	1078 (3.36)[c]	50.89	12.82 (3.65)[c]	50.04	16.37 (4.11)[c]	49.07	13.32 (3.72)[c]	49.89
4.	*C. z. sillemi* 20,000 /ac (20 DAP) + *B. bassiana* 1x10[9] spores/ml (30 DAP)	23.75	12.72 (3.64)[d]	42.05	15.10 (3.95)[d]	41.15	18.83 (4.40)[d]	41.41	15.55 (4.01)[d]	41.50
5.	*C. z. sillemi* 20,000 /ac (20 DAP) + *V. lecanii* 1x10[9] spores/ml (30 DAP)	21.31	15.14 (3.95)[e]	31.03	17.87 (4.29)[e]	30.36	22.67 (4.81)[e]	29.46	18.56 (4.37)[e]	30.17
6.	Dimethoate 30 EC @ 1.7 ml/l	21.32	8.38 (2.98)[b]	61.82	10.11 (3.26)[b]	60.60	12.95 (3.67)[b]	59.71	10.48 (3.31)[b]	60.57
7.	Control	19.93	21.98 (4.74)[f]	0.00	25.66 (5.11)[f]	0.00	32.14 (5.71)[f]	0.00	26.59 (5.20)[f]	0.00
	SEm±	NS	0.030		0.028		0.021		0.041	
	CD ($P = 0.05$)		0.092		0.086		0.065		0.127	

Values in parentheses are square root transformations

In a column, means followed by same letter(s) are not significantly different at $P = 0.05$ as per DMRT, DAP (Days after planting)

Almost similar findings were recorded on 37 and 44 DAP, the lowest population was noticed in the treatment with two applications of *B. bassiana* (8.36 & 11.54/plant) with maximum per cent reduction (65.77 & 61.07) followed by two applications of *V. lecanii* (12.26 & 15.11 thrips/plant) with 49.80 & 49.02 per cent reduction found to be next best treatment. The highest thrips population (17.43 & 21.33/plant) was found in least effective treatment of two rounds of release of *C. z.* sillemi eggs/grubs 20,000/ac (20 and 30 DAP) (Table 1).

Overall, among biocontrol agents the least number of thrips (8.92/plant) was recorded when *B. bassiana* was applied twice with maximum 64.39 per cent reduction followed by two times applications of *V. lecanii* (12.60/plant). The maximum number of 17.87 thrips/plant was noticed in the treatment of two rounds release of *C. z.* sillemi eggs/grubs 20,000 /ac (20 and 30 DAP) (Table 1).

Almost similar results were observed in second and third seasons; among treatments *B. bassiana* was recorded lowest mean thrips population (8.53 & 11.14/ plant) with highest per cent reduction (64.61 & 63.61) as against *C. z.* sillemi (20 and 30 DAP), which recorded maximum population (16.75 & 22.33 thrips/plant) (Table 2 & 3).

In pooled data also almost similar findings were observed in which *B. bassiana* was found to be best among treatments with lowest mean thrips population (9.53/plant) with highest per cent reduction (64.15). The treatment *C. z.* sillemi (20 and 30 DAP) was found to be least effective treatment with maximum thrips population (18.98/plant) (Table 4). In the present investigation ,application of *B. bassiana* 1 x 10^9 spores/ml two times at 20 and 30 DAP was found superior to reduce the infestation of thrips population. This is in agreement with the findings of Gillespie (1986) who observed that isolates of *B. bassiana* (Bals) killed all the treated thrips, *T. tabaci* with in four days. Noma and Strickler (2000) observed that application of *B. bassiana* reduced the thrips population in cotton. Ludwig and Oetting (2002) reported that *B. bassiana* was highly effective against western flower thrips.

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