EVALUATION OF CONVENTIONAL INSECTICIDES AGAINST THRIPS, *Thrips tabaci* LINDEMAN INFESTING ONION (*Allium cepa* L.)

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ABSTRACT

A field experiment was conducted at Main Vegetable Research Station, Anand Agricultural University, Anand, Gujarat, during *rabi* season of the year 2010-2011 to asses the efficacy of nine different insecticides against thrips *viz.*, triazophos, imidacloprid, acephate, clothianidin, deltamethrin, cypermethrin, profenophos, diafenthiuron and bifenthrin in comparison to control (water spary). Out of 9 evaluated insecticides, deltamethrin 2.8 EC 0.028% found most effective against thrips followed by cypermethrin 10 EC 0.01% and diafenthiuron 50 WP 0.05%. Significantly higher bulb yield (74.07 t/ha) was recorded with the spray of deltamethrin followed by cypermethrin (68.98 t/ha), diafenthiuron (66.94 t/ha) and bifenthrin (66.67 t/ha). The highest Net ICBR was recorded from the plots sprayed with deltamethrin (140.97) followed by cypermethrin (118.18).

KEY WORDS: Bulb yield, insecticides, onion, thrips, *Thrips tabaci*

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important vegetable crop, grows extensively throughout the Gujarat state during *rabi* season. Among the various insects pests attacking onion, thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) is a major insect pest. The pest confined its feeding activities during the entire cropping season. Besides feeding losses, the pest also creates congenial condition for spreading various diseases. This minute pest damages by remaining between two close adjacent leaves of onion and lacerates the leaf surface and sucks the oozing resulting to an irregular or blotchy whitening of the leaves, which reduces the vigour of plant and ultimately affect the bulb yield. Chemical insecticides are used as the frontline defence sources against insect pest. However, their indiscriminate and continuous use creates a number of problems such as development of resistance, pest resurgence and environmental hazards including residue in soil, water and foods. Hence, the present investigation was conducted to study the efficacy of different insecticides against onion thrips, *Thrips tabaci* under field conditions.

MATERIALS AND METHODS

Field experiment was carried out Main Vegetable Research Station, Anand Agricultural University, Anand, Gujarat, during *rabi* season of the year 2010-2011, with an objective to evaluate the efficacy of different conventional insecticides against onion thrips. Seedling of onion variety Gujarat White Onion – 1 (GWO 1) were transplanted in the bed size of 1.5 m x 2.0 m at the spacing 15 cm x 10 cm. Nine different insecticides *viz*., triazophos 0.04% (1 ml/lit. of water), imidacloprid 0.009% (0.5 ml/lit. of water), acephate 0.075% (1 g/lit. of water), clothianidin 0.05% (1 g/lit. of water), deltamethrin 0.028% (1 ml/lit. of water), cypermethrin 0.01% (1 ml/lit. of water), profenophos 0.05% (1 ml/lit. of water), diafenthiuron 0.05% (1 g/lit. of water) and bifenthrin 0.01% (1 ml/lit. of water) were evaluated along with untreated check (water spray) in a randomized block design with three replications. First spray of all the respective insecticides was made on appearance of thrips and subsequent 2 sprays were given at 15 days interval. Efficacy of insecticides was evaluated on the basis of number of thrips per plant as well as bulb yield. Five plants were selected randomly from the whole experimental plot for recording the observations. Number of thrips per plant were recorded before 24 hours of first spray as well as 3, 7, 10 and 14 days after each spray by following the methods suggested by Mote (1981). The bulb yield (t/ha) was recorded at harvest. The data obtained on thrips population were analyzed after square root transformation.

Per cent reduction in *T. tabaci* population was calculated by comparing the thrips population obtained from the unprotected plot and the crop protected with different insecticides using following formula.

$$\text{Per cent reduction in population} = \frac{\text{Thrips population in unprotected plot} - \text{Thrips population in protected plot}}{\text{Thrips population in unprotected plot}} \times 100$$

Per cent loss in bulb yield was calculated by comparing the yield obtained from the plot treated with different insecticides using following formula.

$$\text{Per cent avoidable loss in bulb yield} = \frac{\text{Highest yield in treated plot} - \text{yield in treated plot}}{\text{Highest yield in treated plot}} \times 100$$

RESULTS AND DISCUSSION

The efficacy of different insecticides on population of thrips per plant (pooled of periods over sprays) is presented in Table 1. The results indicated that there was uniform population of thrips in the field before the first spray, as the treatment differences were non-significant. The insecticidal treatments with respect to population of thrips were significantly effective when compared with control after 3, 7, 10 and 15 days after sprays.

After 3 days of sprays, deltamethrin 0.028% (2.19 thrips/plant) and cypermethrin 0.01% (2.56 thrips/plant) found significantly superior by recording minimum thrips population than rest of the treatments and both were at par with each other. Diafenthiuron 0.05% (2.89 thrips/plant) significantly effective in reducing thrips population in comparison to acephate 0.075% (4.12 thrips/plant), imidacloprid 0.009% (4.79 thrips/plant), profenophos 0.05% (4.79 thrips/plant) and clothianidin 0.05% (4.84 thrips/plant), but was at par with cypermethrin 0.01% (2.56 thrips/plant) as well as bifenthrin 0.01% (3.38 thrips/plant). Triazophos 0.04% (3.78 thrips/plant) and acephate 0.075% (4.12 thrips/plant) were equally effective, as both were at par with each other but recorded significantly lower thrips population in comparison to imidacloprid 0.009% (4.79 thrips/plant), profenophos 0.05% (4.79 thrips/plant) and clothianidin 0.05% (4.84 thrips/plant). Imidacloprid, profenophos and clothianidin were at par with each other after 3 days of spray.

After 7 days of spray, deltamethrin 0.028% (1.43 thrips/plant) registered significantly lowest thrips population than rest of the treatments. Cypermethrin 0.01% (1.81 thrips/plant) and diafenthiuron 0.05% (2.09 thrips/plant) were at par with each other and proved its significant effectiveness than the remaining insecticides. Triazophos 0.04% (3.07 thrips/plant) was at par with bifenthrin 0.01% (2.70 thrips/plant) on one hand and with acephate 0.075% (3.54 thrips/plant) on other hand of effectiveness after 7 days of spray. Treatments of imidacloprid 0.009% (3.78 thrips/plant), clothianidin 0.05% (4.04 thrips/plant) and profenophos 0.05% (4.04 thrips/plant) were at par with each other and also with acephate 0.075% (3.54 thrips/plant).

After 10 days of spray, deltamethrin 0.028% (1.69 thrips/plant) and cypermethrin 0.01% (1.96 thrips/plant) recorded significantly lower thrips than rest of the treatments, which was followed by diafenthiuron 0.05% (2.42 thrips/plant). Among the insecticides tested, Imidacloprid 0.009% (4.88 thrips/plant), profenophos 0.05% (5.07 thrips/plant) and clothianidin 0.05% (5.16 thrips/plant) recorded significantly higher thrips population.

After 14 days of sprays, deltamethrin 0.028% (2.67 thrips/plant) and cypermethrin 0.01% (3.00 thrips/plant) significantly reduced thrips population than rest of the treatments and both the insecticides were at par with each other. Diafenthiuron 0.05% (4.08 thrips/plant), bifenthrin 0.01% (4.61 thrips/plant) and triazophos 0.04% (4.65 thrips/plant) did not differed significantly from each other, but found significantly effective as compared to acephate, imidacloprid, clothianidin and profenophos. Acephate 0.075% (5.55 thrips/plant), Imidacloprid 0.009% (6.00 thrips/plant), clothianidin 0.05% (6.16 thrips/plant) and profenophos 0.05% (6.47 thrips/plant) were at par with each other.

The data on per cent reduction in thrips population over control in different treatments ranged from 51.26 (clothianidin) to 77.95 (deltamethrin), 59.07 (clothianidin 0.05%) to 85.51 (deltamethrin), 47.02 (clothianidin) to 82.65 (deltamethrin) and 41.87 (profenophos 0.05%) to 76.01 (deltamethrin) after 3, 7, 10 and 14 days of spray, respectively.

The results of onion bulb yield presented in Table 1 indicated that deltamethrin 0.028% recorded significantly higher bulb yield (74.07 t/ha) than rest of the treatments except cypermethrin 0.01% (68.98 t/ha), diafenthiuron 0.05% (66.94 t/ha), bifenthrin 0.01% (66.67 t/ha) and profenophos 0.05% (60.83 t/ha), which were at par with each other.

The minimum per cent avoidable losses were recorded lowest deltamethrin 0.028% (00.00%) followed by cypermethrin 0.01% (6.87%) and diafenthiuron 0.05% (9.63%). However, the maximum per cent avoidable losses were recorded in control (39.87%) followed by clothianidin 0.05% (22.25%) and imidacloprid 0.009% (21.87%).

The economics of various insecticides (Table 1) revealed that the highest Net ICBR (140.97) was obtained from the plots treated with deltamethrin 0.028% followed by cypermethrin 0.01% (118.18), triazophos 0.04% (83.18), acephate 0.075% (81.52), profenophos 0.05% (73.05), bifenthrin 0.01% (68.16), imidacloprid 0.009% (37.09), diafenthiuron 0.05% (34.00) and clothianidin 0.05% (8.89). Though, the diafenthiuron emerged as most effective against *T. tabaci* as well as also registered higher onion bulb yield, the net ICBR was low as compared to triazophos, acephate, profenophos, bifenthrin and imidacloprid. It might be due to very high market price of the insecticide.

The efficacy of various insecticides against thrips was reported by many resecheres. Ambekar and Nayakwadi (2008) found that application of lambda cyhalothrin 0.005% was most effective treatment followed by fipronil 0.01%, acetamiprid 0.004%, bifenthrin 0.016% and diafenthiuron 0.05%. According to Zaman (1989), spray of bifenthrin 15 ml in 100 liter of water reduced the population of *T. tabaci* in onion for more than two weeks. Shiltole *et al.* (2002) showed that acephate @ 660 g a.i./ha were found superior against thrips, *T. tabaci* in onion followed by cypermethrin 75 g a.i./ha and imidacloprid 20 g a.i./ha. These reports are more or less corroborated with present findings.

CONCLUSION

Among the nine different insecticides tested, deltamethrin 2.8 EC 0.028% found most effective against thrips followed by cypermethrin 10EC 0.01% and diafenthiuron 50WP 0.05%. Significantly higher bulb yield (74.07 t/ha) was recorded with the spray of deltamethrin followed by cypermethrin (68.98 t/ha), diafenthiuron (66.94 t/ha) and bifenthrin (66.67 t/ha). The highest Net ICBR was recorded from the plots sprayed with deltamethrin (140.97) followed by cypermethrin (118.18).

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Table 1: Effectiveness of different insecticides against *T. tabaci* in onion (pooled of periods over sprays)

Treatments	Number of Thrips / Plant*					Bulb Yield (t/ha)	Avoid. losses (%)	Net ICBR
	Before Spray	Days After Sprays						
		3	7	10	14			
Triazophos 40 EC 0.04 %	2.34 (4.98)	2.07^{d}(3.78) [61.93]	1.89^{cd}(3.07) [68.90]	2.00^{cd}(3.50) [64.07]	2.27^{b}(4.65) [58.22]	63.06^{bc}	14.86	83.18
Imidacloprid 17.8 SL 0.009 %	2.34 (4.98)	2.30^{e}(4.79) [51.76]	2.07^{e}(3.78) [61.70]	2.32^{e}(4.88) [49.90]	2.55^{cd}(6.00) [46.09]	57.87^{c}	21.87	37.09
Acephate 75 SP 0.075 %	2.34 (4.98)	2.15^{d}(4.12) [58.51]	2.01^{de}(3.54) [64.13]	2.07^{d}(3.78) [61.19]	2.46^{c}(5.55) [50.13]	63.52^{bc}	14.24	81.52
Clothianidin 50 WDG 0.05 %	2.46 (5.55)	2.31^{e}(4.84) [51.26]	2.13^{e}(4.04) [59.07]	2.38^{e}(5.16) [47.02]	2.58^{cd}(6.16) [44.65]	57.59^{c}	22.25	8.89
Deltamethrin 2.8 EC 0.028 %	2.38 (5.16)	1.64^{a}(2.19) [77.95]	1.39^{a}(1.43) [85.51]	1.48^{a}(1.69) [82.65]	1.78^{a}(2.67) [76.01]	74.07^{a}	00.00	140.97
Cypermethrin 10 EC 0.01 %	2.44 (5.45)	1.75^{ab}(2.56) [74.22]	1.52^{b}(1.81) [81.66]	1.57^{a}(1.96) [79.88]	1.87^{a}(3.00) [73.05]	68.98^{ab}	06.87	118.18
Profenophos 50 EC 0.05 %	2.26 (4.61)	2.30^{e}(4.79) [51.76]	2.13^{e}(4.04) [59.07]	2.36^{e}(5.07) [47.95]	2.64^{d}(6.47) [41.87]	60.83^{bc}	17.87	73.05
Diafenthiuron 50 WP 0.05 %	2.43 (5.40)	1.84^{bc}(2.89) [70.90]	1.61^{b}(2.09) [78.82]	1.71^{b}(2.42) [75.15]	2.14^{b}(4.08) [63.34]	66.94^{abc}	09.63	34.00
Bifenthrin 10 EC 0.01 %	2.44 (5.45)	1.97^{c}(3.38) [65.96]	1.79^{c}(2.70) [72.64]	1.93^{c}(3.22) [66.94]	2.26^{b}(4.61) [58.58]	66.67^{abc}	09.99	68.16
Control (Water spray)	2.30 (4.79)	3.23^{f}(9.93)	3.22^{f}(9.87)	3.20^{f}(9.74)	3.41^{e}(11.13)	44.54^{d}	39.87	
S. Em.±								
Insecticides (I)	0.14	0.04	0.04	0.04	0.05	3.22	-	-
Spray (S)	-	0.02	0.02	0.02	0.03	-	-	-
I x S	-	0.07	0.08	0.07	0.09	-	-	-
C. D. (5%)								
Insecticides (I)	NS	0.13	0.12	0.11	0.14	9.58	-	-
Spray (S)	-	0.07	NS	0.06	0.08	-	-	-
I x S	-	0.21	0.21	0.20	0.25	-	-	-
C.V. (%)	9.97	5.81	6.57	5.71	6.39	8.95	-	-

Notes: ***1.****Treatment means with letter(s) in common are not significant at 5 % level of significance in respective column*

2*. Figures in parentheses () are retransformed values; those outside are* $\sqrt{X+0.5}$ ** transformed values*

3. *Figures in [ ] are per cent reduction over control*

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