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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(2): 854-856

www.thepharmajournal.com
Received: 08-11-2022
Accepted: 13-12-2022

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Bio-efficacy of selected insecticides against population reduction of *Thrips tabaci* L. in onion

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DOI: https://doi.org/10.22271/tpi.2023.v12.i2k.18513

Abstract
A field experiment was conducted at Entomology farm, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J) in rabi 2020-21 to evaluate the efficacy of selected insecticides against *Thrips tabaci* L. in onion. A total of nine treatments *viz*., Acetamiprid 20 SP, Fipronil 5 SC, Emamectin benzoate 5 SG, Imidacloprid 17.8SL, Spinosad 45SC, Thiamethoxam 25WG, *Beauvaria basiana* and *Metarhizium anisoplae* along with control were tested for their efficacy against onion thrips 18th standard week followed by the second spray in 21st standard week. All the treatments were statistically superior over control in reducing the population of *T. tabaci* in onion. Among different insecticides tested, Imidacloprid 17.8 SL (0.3ml l^{-1}) proved to be superior over all other insecticides in reducing the population of onion thrips after two sprays. Thiamethoxam 25 WG (0.25gl^{-1}), Acetamiprid 20SP (0.2gl^{-1}) and Fipronil 5C (1.5mll^{-1}), however, also provided efficient control over the target insect pest and were at par with Acetamiprid 20SP (0.2g l^{-1}).

Keywords: *Allium cepa*, *Thrips tabaci*, insecticides, bio-efficacy, imidacloprid

Introduction

Onion (*Allium cepa* L.) is a biennial herbaceous crop of the Alliaceae family (Malik *et al*., 2003) [8]. The importance of onion (*Allium cepa*) has been recognized for a long time (Griffiths *et al*., 2002) [4]. The global onion crop spans 2,43,591 hectares and yields 51,34,362 million tonnes. India is second in terms of area (12.85 lakh hectares) and production (232.62 lakh tonnes), next to China (Mahajan *et al*., 2018) [7]. In Jammu and Kashmir, the onion-producing area is 3.10 thousand hectares with an annual yield of 57.96 thousand tonnes. Onions are predisposed to a wide range of insect pests which can reduce the quality and quantity of the crop produced (Lorbeer *et al*., 2002) [6]. Among different insect pests, *Thrips tabaci* (Lindeman) is the most damaging pest of onion and other *Allium* crops around the world that cause 34-43 percent losses in terms of both quantity and quality (Kumar *et al*., 2001) [5]. Both nymphs and adults are destructive and feed by rasping the leaves and other plant tissues and sucking the plant sap. In addition to inflicting direct harm to plants, they exacerbate purple blotch (Straub and Emmett, 1992) [13] and *Iris Yellow Spot Virus*. Waiganjo *et al*. (2008) [14] recorded leaf damage ranging from 40-60% and yield losses of 10-20% each year in onions due to *T. tabaci*. Furthermore, purple blotch illness may rise due to the harm caused by their feeding (Arantha, 1980) [2]. Controlling this insect is difficult due to its small size, cryptic behaviour, and succulent quality of leaves, which prevent spray solution from reaching after slight disturbance to the thrips due to the predisposition to hide in the central axis near the bulb. As a result, new insecticides from various classes with lower persistence and are environmentally safe and bio-pesticides must be developed to avoid adverse situations. Considering these facts, the current study was undertaken to evaluate various insecticides against thrips (*T. tabaci*) in onions.

Materials and Methods

The present experiment was conducted at Entomology Farm, SKUAST-J (32.73 °N, 74.87 °E) in rabi 2020-21 to evaluate the efficacy of selected insecticides against *T. tabaci* in onion. The onion crop was raised in Randomized Block Design (RBD) with a plot size of 2×2 meter. The spacing adopted for raising the onion was 15 x 10 cm. The crop was sprayed with insecticidal treatments in 18th standard week and the second spray was done in the 21st standard week. There were 9 treatments including control and each treatment was replicated thrice (Table 1).

Five plants were chosen at random from each plot for recording the observation. Thrips populations were counted before spray and 1, 3, 7, and 14 days after each spray. In the control plots, only water was sprayed. Spraying was done with a knapsack sprayer, which was rinsed thoroughly after each spray. The collected data were subjected to statistical analysis to find out the effectiveness of different insecticides. The mortality percentage of target pest population computed by Abbott's (1925) [1] formula:

$$\text{Mortality (\%)} = \frac{\text{Mortality in treatment - Mortality in control}}{\text{100 - Mortality in control}} \times 100$$

Statistical analysis

The data from the experimental location was collected for the target insect pest population. Critical difference for treatments was computed at 5% level of significance using one-way analysis of variance (ANOVA) and post hoc data analysis Tukey HSD test statistical analysis was done by using SPSS 20.0 software.

Results and Discussion

The perusal of the data revealed that the best effect was given by Imidacloprid 17.8 SL after both the sprays which caused 84.26 percent mortality in nymphs of *T. tabaci* after 14 days of the second spray. It was followed by Thiamethoxam 25 WG which induced mortality of 82.10 percent in *T. tabaci* nymphs. Acetamiprid 20 SP and Fipronil 5 C were at par with each other with mortality percentages of 78.27 and 77.37 percent, respectively. Application of Spinosad 45 SC and Emamectin benzoate 5 SG resulted in 65.2 and 48.26 percent mortality. The efficacy of *Beauveria bassiana* and *Metarrhizium anisopliae* were at par with each other and resulted in the least mortality percentages of 37.25 and 34.89 percent, respectively (Table 2). Moreover, the efficacy of different insecticides against *T. tabaci* (adults) revealed that the best effect was given by Imidacloprid 17.8 SL after 14 days of the second spray which reduced the thrips (adults) population by 86.02 percent followed by Thiamethoxam 25 WG with a population reduction of 83.32 percent. Acetamiprid 20 SP and Fipronil 5 C were at par with each other with mortality percentages of 82.17 and 81.32 percent, respectively. Application of Spinosad 45 SC and Emamectin benzoate 5 SG resulted in 61.75 and 46.00 percent mortality in adults of *T. tabaci*. Application of *Beauveria bassiana* caused a mortality percentage of 30.85 percent and *Metarrhizium anisopliae* resulted in the least population reduction of 26.82 per cent over control (Table 3). All the treatments were statistically superior over control in reducing the population of *T. tabaci* (nymphs and adults) in onion. In the present study, two sprays of Imidacloprid (0.3ml/lit) were found most effective for reducing the thrips population followed by Thiamethoxam 25 WG (0.25g/lit) and Acetamiprid 20 SP (0.2g/lit). The results are in corroboration with Mehra and Singh (2013) [9], Shweta *et al.* (2019) [11], and Sherwani *et al.* (2020) [10] who also reported Imidacloprid as the most effective insecticide for reducing the thrips population. Das *et al.* (2017) [3] recorded highest efficacy of imidacloprid 17.8 SL in mitigating the population of *T. tabaci* with highest marketable yield in imidacloprid treated plots. It was elucidated by Singh and Kumar (2011) [12] that Imidacloprid blocks the nicotinergic neural pathway and brings about rapid knockdown in the treated insects by causing paralysis followed by insect death.

Table 1: Treatment details

Treatments		Dose	Concentration (g. a.i./ha)
T1	Acetamiprid 20 SP	0.2g/lit	20
T2	Fipronil 5 SC	1.5 ml/lit	50
T3	Emamectin benzoate 5 SG	0.4g/lit	10
T4	Imidacloprid 17.8 SL	0.3 ml/lit	25
T5	Spinosad 45 SC	0.2 ml/lit	73
T6	Thiamethoxam 25 WG	0.25 g/lit	25
T7	*Beauvaria basiana*	1×10^{12} spores/ha	-
T8	*Metarhizium anisoplae*	1×10^{12} spores/ha	-
T9	Control (water spray)	-	-

Table 2: Efficacy of different treatments against population of *Thrips tabaci* (nymphs) on onion during 2020-21

Insecticides	First Spray					Second Spray				
	1 DBS	Percent reduction of thrips population*				1 DBS	Percent reduction of thrips population*			
		1 DAS	3 DAS	7 DAS	14 DAS		1DAS	3 DAS	7 DAS	14 DAS
Imidacloprid 17.8 SL	28.67	19.99 (26.53)	38.56 (38.36)	56.54 (48.74)	81.48 (64.46)	49.66	23.63 (29.05)	41.73 (40.22)	60.92 (51.28)	84.26 (66.63)
Fipronil 5 SC	29.33	10.68 (19.05)	26.82 (31.17)	45.37 (42.32)	76.18 (60.77)	50.00	12.94 (21.00)	30.32 (33.39)	48.46 (44.10)	77.37 (61.58)
Emamectin benzoate 5 SG	28.66	9.71 (18.13)	14.25 (22.15)	26.16 (30.73)	46.57 (43.01)	49.66	10.73 (19.07)	16.35 (23.83)	25.82 (30.52)	48.26 (43.98)
Acetamiprid 20 SP	28.33	9.49 (17.92)	26.88 (31.19)	53.85 (47.19)	77.58 (61.72)	49.66	11.11 (19.43)	27.74 (31.76)	55.48 (48.12)	78.27 (62.19)
Spinosad 45 SC	28.66	9.82 (18.24)	22.42 (28.23)	37.62 (37.81)	63.22 (52.65)	49.33	11.32 (19.63)	24.51 (29.65)	38.80 (38.51)	65.20 (53.83)
Thiamethoxam 25WG	28.66	11.88 (20.12)	31.76 (34.27)	49.90 (44.92)	80.47 (63.76)	49.00	13.37 (21.43)	34.42 (35.90)	48.66 (44.21)	82.10 (64.96)
Beauveria bassiana	29.33	9.33 (17.71)	14.50 (22.36)	22.57 (28.32)	37.43 (37.70)	49.33	9.85 (18.25)	17.08 (24.38)	24.54 (29.68)	37.25 (37.59)
Metarrhizium anisopliae	29.33	7.71 (16.10)	13.29 (21.33)	18.00 (27.08)	35.45 (36.52)	49.33	8.96 (17.37)	15.91 (23.49)	22.39 (28.21)	34.89 (36.18)
Control (water spray)	29.46	26.60	26.20	25.60	25.20	47.36	30.70	30.30	29.70	29.00
C.D. ($p\leq0.05$)	-	2.12	2.24	2.55	2.15	-	2.52	1.55	1.42	1.50

*Mean of 3 replications; DBS: Days before spray; DAS: Days after spray; The values in the parenthesis are arc sine transformed values

Table 3: Efficacy of different treatments against population of *Thrips tabaci* (adults) on onion during 2020-21

Insecticides	First Spray					Second Spray				
	1 DBS	Percent reduction of thrips population*					Percent reduction of thrips population*			
		1 DAS	3 DAS	7 DAS	14 DAS	1 DBS	1 DAS	3 DAS	7 DAS	14 DAS
Imidacloprid 17.8 SL	25.00	24.62 (29.71)	57.08 (49.05)	75.89 (60.58)	84.04 (66.45)	16.30	28.96 (32.53)	60.02 (50.76)	76.07 (60.70)	86.02 (68.04)
Fipronil 5 SC	25.60	16.24 (23.74)	39.78 (39.08)	47.14 (43.34)	75.60 (60.37)	16.30	17.33 (24.58)	39.72 (39.04)	51.52 (45.85)	81.32 (64.41)
Emamectin benzoate 5 SG	25.30	9.07 (17.42)	33.43 (35.30)	39.02 (38.63)	46.85 (43.17)	15.60	10.35 (18.74)	33.71 (35.47)	42.54 (40.64)	46.00 (42.68)
Acetamiprid 20 SP	26.00	23.28 (28.83)	48.21 (43.95)	55.90 (48.36)	80.10 (63.49)	16.60	26.53 (30.98)	51.81 (46.01)	60.68 (51.16)	82.17 (65.00)
Spinosad 45 SC	25.60	13.45 (21.47)	35.30 (36.42)	41.05 (39.81)	62.25 (52.06)	16.60	14.43 (22.30)	37.55 (37.77)	46.50 (42.97)	61.75 (51.77)
Thiamethoxam 25 WG	25.00	23.56 (29.02)	50.89 (45.49)	55.77 (48.30)	81.43 (64.45)	17.30	27.68 (31.72)	54.61 (47.62)	66.04 (54.36)	83.32 (65.87)
Beauveria bassiana	24.60	8.77 (17.20)	19.69 (26.32)	32.45 (34.70)	30.37 (33.42)	17.30	8.44 (16.87)	24.64 (29.73)	35.01 (36.25)	30.83 (33.71)
Metarrhizium anisopliae	25.00	6.08 (14.28)	14.43 (22.31)	29.27 (32.72)	26.94 (31.25)	16.60	7.23 (15.56)	21.85 (27.83)	31.45 (34.09)	26.82 (31.17)
Control (water spray)	17.10	18.40	18.10	17.50	17.50	20.00	26.40	25.70	25.30	24.80
C.D. ($p \le 0.05$)	-	1.47	1.55	1.88	1.90	-	1.34	2.12	2.76	2.35

*Mean of 3 replications; DBS: Days before spray; DAS: Days after spray; The values in the parenthesis are arc sine transformed values

Conclusion

Among different insecticides used for the management of onion thrips under field conditions, Imidacloprid 17.8 SL (0.3 ml l^{-1}) proved to be superior over all other insecticides and control after two sprays (18th SW and 21st SW). Thiamethoxam 25 WG (0.25 gl^{-1}), Acetamiprid 20 SP (0.2 gl^{-1}), and Fipronil 5 C (1.5 ml l^{-1}), however, also provided efficient control over the target pest (*T. tabaci*) and were at par with each other and therefore, shall be preferred to manage onion thrips (*T. tabaci*) under field conditions.

References

1. Abbott WS. A method of computing the effectiveness of an insecticide. Journal of Economic Entomology. 1925;18:265-267.
2. Arantha KTN. Thrips in vector of plant pathogens, Academic Press, New York; c1980. p. 149-164.
3. Das AK, Hassan W, Singh SK. Management of onion thrips, *Thrips tabaci* using chemical and bio-pesticide for quality onion production. Trends in Bioscience. 2017;10(22):4384-4388.
4. Griffiths G, Trueman L, Crowther T, Thomas B, Smith B. Onions: A global benefit to health. Phytotherapy Research. 2002;16(7):603-615.
5. Kumar NK, Veeregowda R, Sreenivas RE, Krishna, MPN. Response of onion genotypes for thrips (*Thrips tabaci* Lindeman) resistance. In: Proceedings of the Second National Symposium on IPM in Horticultural Crops, New Molecules Pesticides and Biopesticides. Bangalore, India; c2001. p. 17-19.
6. Lorbeer JW, Kuhar TP, Hoffmann MP. Monitoring and forecasting for disease and insect attack in onions and *Allium* crops within IPM strategies. Allium Crop Science: Recent Advances. 2002;2:293-309.
7. Mahajan V, Gupta AJ, Lawande KE, Singh M. Onion improvement in India. Journal of Allium Research 2018;1(1):7-20.
8. Malik MF, Nawaz M, Haffez Z. Evaluation of promising onion (*Allium cepa*) varieties against thrips infestation on the agro-ecosystem of Balochistan, Pakistan. Asian Journal of Plant Sciences. 2003;2:716-718.
9. Mehra K, Singh V. Bioefficacy of new insecticides against *Thrips tabaci* Lindeman on garlic. Indian Journal of Entomology. 2013;75(3):239-241.
10. Sherwani A, Hussain PS, Mukhtar M, Gul S. Bionomics and management of onion thrips (*Thrips tabaci* Lindeman) on onion grown under Kashmir conditions. International Journal of Current Microbiology and Applied Sciences. 2020;9(2):2852-2859.
11. Shweta SH, Gangadhar N, Gopali JB, Basavarajappa MP, Hadimani HP. Bio-efficacy of synthetic insecticides against onion thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae). Journal of Entomology and Zoology Studies. 2019;7(2):38-42.
12. Singh SK, Kumar U. Evaluation of some chemicals, botanicals and bio-pesticide against onion thrips under north Bihar conditions. Bihar Journal of Horticulture. 2011;1:34-35.
13. Straub RW, Emmett B. Pests of monocotyledon crops. In: Vegetable crop pests, Palgrave Macmillan Press London. 1992, 273-262.
14. Waiganjo MM, Gitonga LM, Mueke J. Effects of weather on thrips population dynamics and its implications on the thrips pest management. African Journal of Horticultural Science. 2008;1:82-90.