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Evaluation of different insecticides against flower thrips *Rhipiphorothrips cruentatus* infesting rose

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Abstract
Investigation on Evaluation of insecticides against flower thrips *Rhipiphorothrips cruentatus* was carried out at Karnataka State Department of Horticulture, Shivamogga during 2017-2018 under open field conditions. For this study seven insecticides (acetamiprid 20 SP, imidacloprid 30.5 SC, thiamethoxam 25 WG, dinotefuran 20 SG, diafenthiuron 50 WP, chlorfenapyr 10 EC and dichlorvos 76 EC) including untreated control were tested for recording observation. Result showed that minimum thrips density was found in thiamethoxam 25 WG *i.e.,* 3.19 per flower with maximum per cent reduction over untreated control *i.e.,* 77.39% and it was found superior over other treatments. Thrips density in imidacloprid 30.5 SC was found on par with acetamiprid 20 SP with the population of 4.23 per flower. Chlorfenapyr 10 EC was found to be least effective in reducing thrips population (8.48/flower) and lowest per cent reduction over untreated control *i.e.*, 39.97%.

Keywords: Thrips *Rhiphiphorothrips cruentatus* hood, rose, evaluation, open field conditions

Introduction
Rose being a perennial crop, provides year round food and shelter to pests. The production of rose. Among the various factors affecting production and quality of flowers, pests are of prime importance. The uniform environmental conditions throughout the year favor the multiplication of insect pests around the year and are an ideal for the rapid proliferation of unwanted insects, which constitute an ever-present threat to the quality of flowers. The thrips species (*Scirtothrips dorsalis* Hood) is a recognized pest of many plants, including vegetables, roses, greenhouse grown plants and cotton [2] and thrips (*Scirtothrips dorsalis* Hood) are the notably notorious pests and gaining tremendous importance in recent years owing to their devastating nature and damage potential [1, 11, 12]. The larvae and adults of *S. dorsalis* cause damage at all the stages in a flower [6]. *Scirtothrips dorsalis* alone can cause 28-95% damage [6]. It is important to detect and manage thrips on rose because even at low densities on flowers can cause petal discoloration. Thrips are tiny insect that reproduce rapidly and congregate in tight places that can make difficult pesticide coverage and feed with rasping type of mouth part and that can result in deformation of leaves and petals [5]. When thrips feed on plants that are infected with tomato spotted wilt virus, they act as vector and spread diseases to other crops [3]. Once plants are infected, it is too late to do anything except dispose of the diseased plants. Thus, the best way to prevent viral infection is to control thrips from the beginning of the plant growth. Several insecticides like monocrotophos, endosulfan and lambda cyhalothrin have been recommended for managing *S. dorsalis*. However, pest-suppression achieved is not to the level desired [4, 9]. Reddy *et al*., (2001) [14] found that application of fipronil, followed by thiamethoxam, acetamiprid and dimethoate, were effective in controlling rose thrips. Severe infestation of thrips causes burning of flower buds. Infested flower petals lose their brightness resulting in a direct loss to the grower. Therefore, keeping in view the economic importance of the crop and the magnitude of the damage caused by insect pests, the present study has been taken up. The present investigation on "Evaluation of different insecticides against flower thrips infesting rose" was carried out at Karnataka State Department of Horticulture (KSDH) Shivamogga from 2017-2018.

Materials and Methods
For the evaluation of insecticides against thrips the experiment was conducted in Karnataka State Department of Horticulture, Shivamogga during 2017-2018 under open field conditions.

For this experiment, variety Dutch was selected. The bed was divided into 10 plants per treatment with a spacing of 90 cm and 90 cm between the plants and rows, respectively in randomized block design with three replications.

The Sample procedure

Eight insecticides including untreated control against thrips were tested for recording observation, five plants were randomly selected from each plot and observations on thrips were recorded at one day before and 3, 5, 10 and 14 days after each spray. On each plant, the observation of thrips were recorded by tapping flowers five times against white cardboard sheet and thrips fallen on the white cardboard sheet were counted.

Preparation of slide

The specimens were removed from the 75 per cent alcohol and were placed in a cavity block with 10 per cent alcohol. The specimens were removed than dehydrated through a series of alcohols; 80 per cent for 20 minutes, in 95 per cent alcohol for 10 minutes, in 100 per cent alcohol for 5 minutes or less. Then the specimens were kept till they cleared.

The specimens so cleared were mounted on slide on a drop of Canada balsam and covered with the cover slip gently to avoid the bubbles. The cover slip was gently tilted and pressed to spread the wings and arrange the specimen. Then the slides were allowed to dry.

Identification

The specimens of thrips on rose in open field condition were collected and preserved in 75 per cent alcohol. Thrips specimens were sent to Dr. Kaomud Tyagi, thrips taxonomist Zoological Survey of India Kolkata for identification.

Statistical analysis

The statistical analysis of the data obtained from management trails was done by analysis of variance (ANOVA) using Web Agri Stat Package (WASP-2) developed by Indian Council of Agricultural Research, research complex, Goa. After analysis, data was accommodated in the table as per the needs of objectives for interpretation of results. The interpretation of data was done by using the critical difference value calculated at 0.05 probability level. The level of significance was expressed at 0.05 probability.

Results and Discussion

First spray:

Pre-treatment number of thrips in all the plots ranged in 8.62 to 9.75 per plant and treatment differences were non-significant in 2017-2018 at Karnataka State Department of Horticulture, Shivamogga. All the insecticidal treatments at 3, 5, 10 and 14 days after spray were superior to untreated control in reducing the pest population (Table 1). However thiamethoxam 25 WG was most effective treatment which recorded minimum thrips density, this insecticide reduced thrips density from 9.21 to 3 per flower. Thrips density in imidacloprid 30.5 SC was on par with thiamethoxam 25 WG with thrips population of 4.05 per flower. Acetamiprid 20 SP was on par with thiamethoxam 25 WG and imidacloprid 30.5 SC registering thrips population of 5.17 per flower. 5 days after spraying, thiamethoxam 25 WG was most effective and recorded significantly less thrips population (2.16/flower) and emerged as significantly superior, followed by imidacloprid 30.5 SC and acetamiprid 20 SP. In chlorfenapyr 10 EC maximum thrips population of 6.86 per flower was noticed. The data recorded on 10 days after spraying indicated that thiamethoxam 25 WG was most effective and promising insecticide showing thrips population of 4.07 per flower and significantly higher thrips population (8.51/flower) was noticed in chlorfenapyr 10 EC treated plots. The data recorded on 14 days after spraying revealed that thrips population varied from 5.19 to 9.65 per flower. All the treatments were significantly superior over untreated control in reducing thrips population. Thiamethoxam 25 WG was significantly superior over other treatments by recording significantly less number of thrips population (5.19/flower).

Second spray

All the insecticidal treatments after 3, 5, 10 and 14 days were superior to untreated control in reducing the pest population (Table 1). The data recorded on 3 days after treatment showed that all the treatments were significantly superior over untreated control. Thiamethoxam 25 WG emerged as significantly superior over all others recording significantly less number of thrips population 2.21 per flower. Imidacloprid 30.5 SC, dinotefuran 20 SG, dichlorvos 76 EC and diafenthiuron 50 WP were next in efficacy to thiamethoxam 25 WG. The maximum thrips population (8.51/flower) amongst treated plots was observed in chlorfenapyr 10 EC. The observation recorded on 5 DAS indicated that consistent higher efficacy of thiamethoxam 25 WG with survival population of 1.52 per flower. Further, imidacloprid 30.5 SC stood second best in efficacy and significantly superior over control. On 10 DAS, thiamethoxam 25 WG was superior to other treatments. This was on par with treatments imidacloprid 30.5 SC and acetamiprid 20 SP. In chlorfenapyr 10 EC treated plots 9.12 thrips per flower were recorded, which was higher than that observed in all other treatments but significantly lower than in untreated control. Similar trend was observed on 14 days after spraying. Thiamethoxam 25 WG was most effective by recording significantly less thrips population (4.23/flower). Chlorfenapyr 10 EC recorded significantly maximum population (10.12/flower). Maximum per cent reduction over untreated control was found in thiamethoxam 25 WG *i.e.*, 77.39%, which was followed by imidacloprid 30.5 SC *i.e.*, 70.05% and lowest per cent reduction over untreated control was found in chlorfenapyr 10 EC *i.e.*, 39.97%.

In the present investigation thiamethoxam 25 WG was found to be most effective in reducing the thrips population. It was found that imidacloprid 30.5 SC and acetamiprid 20 SP were comparable with their efficacy. When the per cent control was calculated, it was noticed that thiamethoxam 25 WG could reduce the thrips population to an extent of 70.89 and 82.45 per cent in first and second spray respectively. These results are comparable with Murugan and Jagadish (2004) [7] reported that imidacloprid was most effective in reducing thrips population. Reddy *et al*. (2005) [13] who reported that thiamethoxam was most effective for controlling the thrips population. Mehmood *et al.* (2012) [8]. Reported that acetamiprid was proved the best insecticide. Lobna (2012) [7] suggested that high initial activity was observed with imidacloprid exhibiting 89.9 per cent reduction of thrips population followed by thiamethoxam by recording 67.7 to 79.1 per cent population reduction.

Table 1: Evaluation of insecticidal sprays against flower thrips *Rhipiphorothrips cruentatus* during 2017-2018

Treatment details	Dose (ml or g/lit)	Mean no. of thrips per flower									Mean	% reduction of thrips over untreated control
			1st Spray				2nd Spray					
		1 DBS	3 DAS	5 DAS	10 DAS	14 DAS	3 DAS	5 DAS	10 DAS	14 DAS		
Acetamiprid 20 SP	0.30	8.92 (3.06)	5.17 (2.38)[bcd]	4.15 (2.15)[cd]	5.99 (2.52)[bcd]	7.30 (2.79)[bcd]	5.12 (2.35)[cd]	3.94 (2.1)[c]	5.38 (2.43)[de]	6.27 (2.6)[cde]	5.42	61.64
Imidacloprid 30.5 SC	0.50	8.62 (3.02)	4.05 (2.12)[cd]	3.51 (1.97)[de]	5.00 (2.33)[cd]	6.16 (2.55)[cd]	3.51 (1.98)[de]	2.19 (1.59)[d]	3.93 (2.1)[ef]	5.47 (2.44)[de]	4.23	70.05
Thiamethoxam 25 WG	0.20	9.21 (3.09)	3.0 (1.86)[d]	2.16 (1.62)[e]	4.07 (2.1)[d]	5.19 (2.38)[d]	2.21 (1.62)[e]	1.52 (1.41)[d]	3.16 (1.91)[f]	4.23 (2.17)[e]	3.19	77.39
Chlorfenapyr 10 EC	1.60	9.87 (3.22)	7.15 (2.75)[b]	6.86 (2.71)[b]	8.51 (3.00)[b]	9.65 (3.18)[b]	8.51 (2.99)[b]	7.48 (2.82)[b]	9.52 (3.17)[b]	10.12 (3.26)[b]	8.48	39.97
Diafenthiuron 50 WP	1.20	9.75 (3.19)	7.07 (2.75)[b]	6.09 (2.57)[bc]	7.80 (2.84)[bc]	9.30 (3.13)[b]	8.2 (2.94)[b]	7.21 (2.77)[b]	8.78 (3.05)[bc]	9.75 (3.2)[b]	8.03	43.16
Dinotefuran 20 SG	0.20	9.29 (3.12)	5.93 (2.52)[b]	5.01 (2.33)[bcd]	6.80 (2.67)[bcd]	8.63 (3.02)[bc]	6.61 (2.66)[bc]	5.53 (2.45)[bc]	6.11 (2.57)[cde]	7.56 (2.84)[bcd]	6.52	53.80
Dichlorvos 76 EC	1.60	9.34 (3.13)	6.83 (2.66)[bc]	5.78 (2.49)[bc]	7.48 (2.82)[bc]	9.00 (3.07)[b]	7.5 (2.83[bc]	6 (2.54)[b]	7.6 (2.84)[bcd]	8.71 (3.04)[bc]	7.36	47.85
Untreated control	-	9.61 (3.17)	11.09 (3.4)[a]	11.52 (3.46)[a]	13.05 (3.68)[a]	13.85 (3.79)[a]	14.26 (3.83)[a]	14.75 (3.9)[a]	16.88 (4.12)[a]	17.54 (4.19)[a]	14.12	-
S.Em±	-	NS	0.20	0.15	0.20	0.16	0.17	0.14	0.16	0.18	-	-
CD (P = 0.05)	-	NS	0.60	0.47	0.59	0.48	0.52	0.43	0.50	0.53	-	-
CV%	-	-	13.46	11.01	12.32	9.12	11.13	10.08	10.24	10.28	-	-

Figures in parentheses are √x + 0.5 transformed values; Means in the columns followed by the same alphabet do not differ significantly by DMRT (P = 0.05); DBS-Day before spray; DAS-Days after spray;

Conclusion

Imidacloprid 30.5 SC, thiamethoxam 25 WG, dinotefuran 20 SG were found to be quite effective insecticides for managing the thrips population. Whereas, Chlorfenapyr 10 EC was found to be least effective for the management of thrips population.

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