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Evaluation of Different Insecticides against Aphid, *Macrosiphum euphorbiae* Infesting Rose

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ABSTRACT: Rose plant is affected by several insects, mites, diseases and nematodes posing a serious threat to rose cultivation. Insects and mites attack different parts of rose plants at every phenophase of growth. Insect and mite pests on rose can cause 28–95% damage individually or in groups both in field and polyhouse. Cultural practices and botanicals can reduce the pest population. Insecticides should be applied as and when required. Hence, investigation on evaluation of different insecticides against aphid, *Macrosiphum euphorbiae* 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, thiomethoxam 25 WG, dinutefuron 20 SG, diafenthiuron 50 WP, chlorfenapyr 10 EC and dichlorvos 76 EC) were tested, along with an untreated control. The overall mean aphid population after spraying insecticides indicated that, imidacloprid 30.5 SC was superior (8.47 per 5 cm twig). When compared to imidacloprid 30.5 SC, treatments with dinotefuron 20 SG and acetamiprid 20 SP were found to be equally effective (14.06 and 15.53 per 5 cm twig). Among the treatments, imidacloprid 30.5 SC had the highest percent reduction of 81.17, followed by thiamethoxam 25 WG and dinotefuron 20 SG (73.77 and 68.76% respectively).

Keywords: *Macrosiphum euphorbiae*, rose, insecticides and open field conditions.

INTRODUCTION

Flowers are indivisible from the communal fabric of human life. It plays an important role in country's economic growth with respect to agriculture. Flowers being adorable Creation of God benefits all occasions (Maity *et al.*, 2015). India's 'flower power' continues to bloom with the country emerging as the second largest grower of flowers around the world, surpassed only by China. About 249 million hectares across the country was used for floriculture, producing 2143 metric tonnes of loose flowers and 76,732 lakh cut flowers, according to the latest data of the National Horticulture Board for 2014-15. The major flower growing states are Karnataka, Tamil Nadu and Andhra Pradesh in the South, West Bengal in the East, Maharashtra in the West and Rajasthan, Delhi and Haryana in the North (Sathyan *et al.*, 2017).

Major flowers of commercial importance in India are rose, gladiolus, tuberose, carnation, chrysanthemum, gerbera, lily and marigold. Amongst them, Rose is universally acclaimed as "Queen of Flowers" and is one of the most important ornamental flower species used in landscape and cut flowers the world over (Shefalikumari *et al.*, 2022). Rose (*Rosa* spp.) is a popular flowering shrub in India and other parts of the world. Roses have been cultivated in gardens for centuries as vines, shrubs, specimen plants, ground-covers and container plants because of their beautiful and often fragrant blooms. Commercial rose cultivation in open-field and protected structures is gaining popularity, with the area under cultivation growing by the day. Pests are one of the most important factors influencing flower production and quality. The year-round uniformity of environmental conditions favours the multiplication of insect pests and is ideal for the rapid proliferation of unwanted insects, which pose an ever-present threat to the quality of flowers. Aphids, thrips, whiteflies and various lepidopteran larvae are just a few examples. Rose buds, leaves and flowers are extremely vulnerable to insect infestations. As a result, these insect pests reduce rose yields (Karlik and Tjosvold 2003). There are over 4,000 aphid species in the world. The life cycles and preferred hosts of each type of aphid differ. *Rosa* species narrate thirty-one aphid species. Rose aphids (*M. rosae* L.) and *M. rosaeiformis*, potato aphids *M. euphorbiae* (Thomas) and cotton aphids (*Aphis gossypii*) are serious pests of rose plants. Aphid infestations can cause leaves to curl upward and completely kill a small new plant. As they feed, they excrete a sticky honeydew-like substance that ants find appealing. They excrete a sticky honeydew-like substance that ants find attractive as they feed. This honeydew substance can grow moulds or fungus over time, causing the surface to appear black and discoloured (Jayma and Ronald 1992). As a result, given the crop's economic importance and the magnitude of the damage caused by insect pests, the current study has been undertaken.

MATERIAL AND METHODS

The experiment was carried out in the Karnataka State Department of Horticulture, Shivamogga, during the years 2017 and 2018. Variety Dutch was chosen for this experiment. The bed was divided into 10 plants per treatment, with 90 cm and 90 cm spacing between plants and rows, respectively, in a randomised block design with three replications.

A. The sample procedure

For recording observations, eight insecticides, including an untreated control, were tested against aphids (Table 1). Five plants were chosen at random from each plot, and aphid observations were made one day before, three, five, ten, and fourteen days after each spray. The observation on aphids was taken from five plants by selecting 5 cm tender twigs from the top, middle, and bottom canopy levels then the number of aphids were counted and mean number was calculated.

B. 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.

RESULT AND DISCUSSION

First spray. Table 2 shows the data on pre-count and post-count observations of the average number of aphid population. The data showed that the pre-count in different treatment plots ranged from 34.45 to 37.52 per 5 cm twig. These observations were not statistically significant.

The data obtained three days after treatment revealed that the aphid population ranged from 15.12 to 24.70 in various treatments, while it was 35.0 in the untreated control. All the treatments were significantly superior over control in reducing aphid population. The imidacloprid 30.5 SC treatment was found to be significantly superior in reducing the aphid population (15.12 per 5 cm twig). It was, however, comparable to thiamethoxam 25 WG (17.53 per 5 cm twig). The next most effective treatments were dinotefuron 20 SG, acetamiprid 20 SP, diafenthiuron 50 WP, and dichlorvos 76 EC, which produced 18.66, 20.78, 21.33, and 23.61 aphids per 5 cm twig, respectively. Chlorfenapyr 10 EC was found to be the least effective, with 24.70 aphids per twig recorded. (Table 2).

The observation 5 days after spraying revealed that imidacloprid 30.5 SC @ 0.5 ml/l had the lowest population of aphids (12.96 per 5 cm twig), followed by thiamethoxam 25 WG @ 0.2 g/l (16.45 per 5 cm twig), and dinotefuron 20 SG @ 0.2 g/l (17.09 aphids per twig). Acetamiprid 20 SP @ 0.3 g/l (19.03 per 5 cm twig) and diafenthiuron 50 WP (19.63 per 5 cm twig) were the next best treatments in terms of aphid population control. In comparison to other treatments, the untreated control had the highest population of aphids (35.78 per 5 cm twig) (Table 2).

Imidacloprid 30.5 SC (16.19 aphids per 5 cm twig) was found to be superior to other treatments by reducing aphids by 57.81% at 10 DAS, followed by thiamethoxam 25 WG (18.76 per 5 cm twig). In comparison to other treatments, chlorfenapyr 10 EC had the highest aphid population (27.61 per 5 cm twig). Untreated control was found to be the least effective, with the highest population of aphids (38.15 per 5 cm twig).

At 14 DAS, all treatments were significantly superior to the control; imidacloprid 30.5 SC (18.88 per cm twig) had the lowest aphid population. The highest aphid population was found in chlorfenapyr 10 EC, at 30.72 per 5 cm twig.

The mean aphid population after insecticide spraying was lowest in imidacloprid 30.5 SC (15.79 per 5 cm twig), followed by thiamethoxam 25 WG (18.60 per 5 cm twig) and dinotefuron 20 SG (20.08 per 5 cm twig). Untreated control was found to be the least effective, with the highest population of aphids (37.4 per 5 cm twig) (Table 2).

Per cent reduction over untreated control. When compared to the untreated control, imidacloprid 30.5 SC had the highest percentage reduction (57.81), followed by thiamethoxam 25 WG (50.29), dinotefuron 20 SG (46.34), acetamiprid 20 SP (41.40), diafenthiuron 50 WP (39.57), dichlorvos 76 EC (32.79), and chlorfenapyr 10 EC (29.36).

Second spray. Table 3 shows the data on insecticide efficacy after the second spray. Aphid populations ranged from 8.09 to 19.90 per 5 cm twig at 3 DAS. Imdidacloprid 30.5 SC retained its superiority in aphid population reduction, i.e., 8.09 per 5 cm twig. Thiamethoxam 25 WG, dinotefuron 20 SG, and acetamiprid 20 SP, on the other hand, recorded 10.56, 13.54, and 14.42 aphids per 5 cm twig. These treatments were found on par with each other Aphid population increased from 40.74 to 42.41 per 5 cm twig in the untreated control.

At 5 DAS, imidacloprid 30.5 SC and thiamethoxam 25 WG remained on par with each other and significantly superior to other treatments in terms of lowest aphid population per twig (5.13 and 13.58, respectively). Chlorfenapyr 10 EC had the highest aphid population of the treatments, with 16.89 per 5 cm twig.

The aphid population ranged from 8.11 to 20.22 per 5 cm twig 10 days after spraying. All the treatments were significantly superior over control. The plots treated with imidacloprid 30.5 SC had the lowest incidence of 8.11 per 5 cm twig, making it the significantly superior treatment. It was, however, comparable to thiamethoxam 25 WG and dinotefuron 20 SG, with aphid populations of 15.56 and 16.90 per 5 cm twig, respectively (Table 3).

It is evident from the data that aphid population recorded at 14DAS varied from 12.56 to 23.96 per 5 cm twig and 48.32 in untreated control. The superiority of imidacloprid 30.5 SC was found persisted and emerged as significantly superior over rest of the treatments. The treatment with chlorfenapyr 10 EC was least effective in controlling the aphid population *i.e*., 23.96 per 5 cm twig (Table 3).

The overall mean aphid population after insecticide spraying revealed that imidacloprid was superior 30.5 SC (8.47 per 5 cm twig). When compared to imidacloprid 30.5 SC, treatments with dinotefuron 20 SG and acetamiprid 20 SP were found to be equally effective (14.06 and 15.53 per 5 cm twig).

Among the treatments, imidacloprid 30.5 SC had the highest percent reduction of 81.17, followed by thiamethoxam 25 WG and dinotefuron 20 SG (73.77 and 68.76%) (Table 3).

The current findings are consistent with the findings of John *et al.* (1998), who reported that thiamethoxam and acetamiprid were the most effective in reducing aphid population. According to Patil *et al*. (2009); Neelima *et al.* (2011), thiamethoxam 25 WG and imidacloprid 17.8 SL were found to be superior by recording the fewest number of aphids. According to Misra (2002), imidacloprid 200 SL and thiamethoxam 25 WG were significantly superior in controlling aphids on okra.

Table 1: Treatment details for testing the efficacy of insecticides against *Macrosiphum euphorbiae.*

Treatments	Chemicals	Dosage (gm or ml/lit)	Trade name
T_1	Acetamiprid 20 SP	0.30	Pride
T_2	Imidacloprid 30.5 SC	0.50	Confidor
T_3	Thiamethoxam 25 WG	0.20	Actra
T_4	Dichlorvos 76 EC	1.60	Nuvan
T_5	Chlorefenapyr 10 EC	1.60	Interprid
T_6	Difenthiuron 50 WP	1.20	Pegasus
T_7	Dinotefuron 20 SG	0.20	Osheen
T_8	Untreated control		

Table 2: Evaluation of insecticidal sprays against aphid *Macrosiphum euphorbiae* during 2017-2018 as assumed by mean number of aphids recorded following first spray.

Sr. No.	Treatments	Dose (ml or g/lit)	Mean no. of aphids per 5 cm twig					Overall mean no. of aphids per 5 cm twig	Per cent reduction over untreated control
			1 DBS	3 DAS	5 DAS	10 DAS	14 DAS		
1.	Acetamiprid 20 SP	0.30	35.27 (5.97)	20.78 (4.59)^{bcd}	19.03 (4.42)^{bcd}	22.72 (4.82)^{bcd}	25.17 (5.07)^{bcd}	21.93±2.28	41.40
2.	Imidacloprid 30.5 SC	0.50	34.67 (5.87)	15.12 (3.94)^{d}	12.96 (3.67)^{e}	16.19 (4.08)^{d}	18.88 (4.40)^{d}	15.79±2.13	57.81
3.	Thiamethoxam 25 WG	0.20	36.39 (6.07)	17.53 (4.24)^{cd}	16.45 (4.11)^{de}	18.76 (4.39)^{cd}	21.66 (4.71)^{cd}	18.60±1.94	50.29
4.	Chlorfenapyr 10 EC	1.60	36.61 (6.08)	24.70 (5.01)^{b}	22.69 (4.82)^{b}	27.61 (5.30)^{b}	30.72 (5.59)^{b}	26.43±3.03	29.36
5.	Diafenthiuron 50 WP	1.20	37.52 (6.16)	21.33 (4.65)^{bc}	19.63 (4.49)^{bcd}	23.78 (4.93)^{bc}	25.70 (5.10)^{bcd}	22.61±2.31	39.57
6.	Dinotefuron 20 SG	0.20	35.83 (6.02)	18.66 (4.38)^{bcd}	17.09 (4.19)^{cde}	21.29 (4.61)^{bcd}	23.27 (4.88)^{bcd}	20.08±2.37	46.34
7.	Dichlorvos 76 EC	1.60	37.43 (6.16)	23.61 (4.91)^{bc}	21.36 (4.68)^{bc}	25.73 (5.06)^{bc}	29.89 (5.47)^{bc}	25.15±3.14	32.79
8.	Untreated control	-	34.45 (5.90)	35.00 (5.95)^{a}	35.78 (5.99)^{a}	38.15 (6.21)^{a}	40.74 (6.39)^{a}	37.42±2.24	-
	SEm±	-	NS	0.23	0.18	0.27	0.26	-	-
	CD (P = 0.05)	-	NS	0.69	0.56	0.83	0.79	-	-
	CV%	-	-	8.39	7.03	9.58	8.54	-	-

Figures in parentheses are $\sqrt{x + 0.5}$ 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


a. Aphid infestation on leaf


b. Aphid infestation on twig


Damaging symptoms of *Macrosiphum euphorbiae*on different plant parts of rose

Table 3: Evaluation of insecticidal sprays against aphid *Macrosiphum euphorbiae* during 2017-2018 as assumed by mean number of aphids recorded following second spray.

Sr. No.	Treatments	Dose (ml or g/lit)	Mean no. of aphids per 5 cm twig					Mean no. of aphids per 5 cm twig	Per cent reduction over untreated control
			1 DBS	3 DAS	5 DAS	10 DAS	14 DAS		
1.	Acetamiprid 20 SP	0.30	25.17 (5.07)[cd]	14.42 (3.86)[bcd]	13.58 (3.73)[bc]	15.92 (4.05)[bc]	18.19 (4.31)[cde]	15.53±1.75	65.50
2.	Imidacloprid 30.5 SC	0.50	18.88 (4.40)[d]	8.09 (2.93)[e]	5.13 (2.37)[d]	8.11 (2.93)[e]	12.56 (3.61)[e]	8.47±2.65	81.17
3.	Thiamethoxam 25 WG	0.20	21.66 (4.71)[cd]	10.56 (3.33)[de]	9.65 (3.18)[cd]	11.46 (3.46)[de]	15.56 (4.00)[de]	11.81±2.25	73.77
4.	Chlorfenapyr 10 EC	1.60	30.72 (5.59)[b]	19.90 (4.44)[b]	16.89 (4.17)[b]	20.22 (4.50)[b]	23.96 (4.95)[b]	20.24±2.50	55.02
5.	Diafenthiuron 50 WP	1.20	25.70 (5.10)[bcd]	16.45 (4.12)[bc]	15.53 (3.86)[bc]	18.15 (4.32)[bc]	21.40 (4.68)[bcd]	17.88±2.23	60.27
6.	Dinotefuron 20 SG	0.20	23.27 (4.88)[bcd]	13.54 (3.75)[cd]	11.29 (3.43)[bc]	14.50 (3.87)[cd]	16.90 (4.17)[cde]	14.06±2.01	68.76
7.	Dichlorvos 76 EC	1.60	29.89 (5.47)[bc]	18.33 (4.34)[bc]	16.48 (4.12)[b]	19.57 (4.48)[b]	23.11 (4.80)[bc]	19.37±2.42	56.96
8.	Untreated control	-	40.74 (6.39)[a]	42.41 (6.55)[a]	43.14 (6.60)[a]	46.16 (6.83)[a]	48.32 (6.98)[a]	45.01±2.37	-
	SEm±	-	0.26	0.22	0.30	0.17	0.23	-	-
	CD (P = 0.05)	-	0.78	0.67	0.92	0.53	0.70	-	-
	CV%	-	8.54	9.23	13.38	7.02	8.57	-	-

Figures in parentheses are $\sqrt{x + 0.5}$ 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

CONCLUSIONS

Overall results of the study conclude asimidacloprid 30.5 SC was found effective in controlling the aphids followed by thiamethoxam 25 WG and dinotefuron 20 SG.

FUTURE SCOPE

As sucking insect pests emerge and wreak havoc on field crops as well as flower and vegetable crops, it is critical to manage these pests. As a result, appropriate, economical, and long-term management is the best way to combat the threat posed by these pests.

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