International Journal of Advanced Biochemistry Research 2025; 9(7): 1181-1185

International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; 9(7): 1181-1185
www.biochemjournal.com
Received: 25-04-2025
Accepted: 30-05-2025

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Assessment of spray interval for management of major sucking pest of rose

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i7o.4910

Abstract

The present investigation was carried out during 2024 at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, with an objective to assess the spray interval for management of major sucking pest of rose *viz.*, aphid (*Macrosiphum rosaeformis Hood*), thrips (*Rhipiphorothrips cruentatus*), leafhopper (*Edwardsiana rosae*), mite (*Tetranychus cinnabarinus*). From the present investigation, it is concluded that the minimum pest population of the above-mentioned pests were recorded in the treatment T_1 (Abamectin 01.90 EC at five-day interval). This is followed by treatment T_2 (Abamectin 01.90 EC at six-day interval), treatment T_3 (Abamectin 01.90 EC at seven-day interval), treatment T_4 (Abamectin 01.90 EC at eight-day interval) and treatment T_5 (Abamectin 01.90 EC at nine-day interval). Since, up to the treatment T_6 (at ten-days) any sucking pests couldn't crosses the Economic Threshold Level ETL, and ten-day spraying interval is found suitable for effective management of major sucking pest of rose. However, in the case of mite infestation it does not crosses the Economic Threshold Level (ETL) at any stage of crop.

Keywords: Assessment, economic threshold level (ETL), aphid, thrips, leafhopper, mite

1. Introduction

Flowers have always held a significant place in human society, closely woven into cultural and social traditions. In agriculture, they contribute notably to a nation's economic development. As one of nature's most cherished creations, flowers mark every major life event from birth and weddings to funerals. India has firmly established itself as a global leader in floriculture, ranking as the second-largest flower producer worldwide, just after China (Sathyan *et al.*, 2017) [11]. The use of flowers in India is deeply cultural and differs in many ways from global practices, though modern floriculture is now a worldwide industry. Popular flowers in the commercial flower trade include roses, chrysanthemums, gladiolus, and tuberose. According to flower trend projections, blooms like chrysanthemums, peonies, tillandsia, roses, hydrangeas, and sensitive vines were among the most sought-after in 2020. The Indian floriculture industry has seen notable expansion, driven by increasing demand for both loose and cut flowers, accelerated urban growth, improved logistics, and supportive initiatives aimed at boosting the sector. (Malviya *et al*. 2022) [10]. Roses are especially vulnerable to a wide range of pests that can inflict significant damage. Throughout their growth cycle, whether in nurseries or garden beds rose plants frequently face pest infestations, which adversely impact their overall quality, either directly or indirectly. Determining the appropriate spray interval for abamectin on rose crops is crucial to ensuring effective pest management while safeguarding plant health. The primary goal is to optimize pest control particularly against aphids, thrips, and mites while minimizing chemical input, reducing costs, and avoiding the development of resistance. Applying abamectin at well-timed intervals is expected to suppress pest populations effectively without causing harm to the rose plants. However, frequent applications at short intervals may accelerate pest resistance, making the treatment less effective over time. Additionally, excessive use may cause phytotoxic effects, such as leaf burn or stunted growth, which required more expenditure, affecting the overall quality and bloom of the roses. On the other hand, longer spray intervals might allow pest populations to recover, leading to increased damage. Therefore, present investigation was carried with an objective to determining the ideal spray interval essential to maintaining pest control efficiency, preserving plant health, and preventing resistance development in rose pest.

2. Materials and Methods

The field trial was conducted to assess spray interval for management of major sucking pest of rose at field of Department of Floriculture and Landscape Architecture, during kharif season 2024. The existing rose field having variety gladiator with spacing 1×1 m was selected. The treatment details were as follows treatment T_1 (Abamectin 01.90 EC 0.5ml/lit at five-day interval), treatment T_2 (Abamectin 01.90 EC 0.5ml/lit at six-day interval), treatment T_3 (Abamectin 01.90 EC 0.5ml/lit at seven-day interval), treatment T_4 (Abamectin 01.90 EC 0.5ml/lit at eight-day interval), treatment T_5 (Abamectin 01.90 EC 0.5ml/lit at nine-day interval), treatment T_6 (Abamectin 01.90 EC 0.5ml/lit at ten-day interval), treatment T_7 (Abamectin 01.90 EC 0.5ml/lit at twelve-day interval) and treatments T_8 (Abamectin 01.90EC 0.5ml/lit at fifteen-day interval).Treatment was imposed after crossing ETL by any one pest (aphid, thrips, leafhopper and mite) and subsequent sprays were give as per treatment. The spray used was 500 litres ha-1, with using a knapsack sprayer.

The population of aphids, thrips, leafhopper and mites was assessed from six leaves representing the top, middle and bottom portion from each plant on five randomly selected plants / replication. Prior to spray and weekly observation were taken after spray. Yield of cut flowers from each plot were counted and plucked from the plot on 10^{th} day after each picking. The data thus obtained was statistically analysed.

3. Results and Discussion

3.1 Effect of insecticide on aphid population at different day interval

The results (Table 1) shows that the minimum aphid (*Macrosiphum rosaeformis*) population was recorded in the treatment T_1 (Abamectin 01.90 EC at five-day interval) (2.49) and observed to be most effective amongst all the treatments. This treatment was found at par with treatment T_2 (Abamectin 01.90 EC at six-day interval) (3.54). The next promising treatment were treatment T_3 (Abamectin 01.90 EC at seven-day interval) (5.62), treatment T_4 (Abamectin 01.90 EC at eight-day interval) (5.75) and treatment T_5 (Abamectin 01.90 EC at nine-day interval) (6.56) were found on par with each other. This is followed by treatment T_6 (Abamectin 01.90 EC at ten-day interval) (9.06) and treatment T_7 (Abamectin 01.90 EC at twelve-day interval) (10.38). The overall result on cumulative effect of insecticide on aphid population at different day interval showed that Abamectin 01.90 EC at five-day interval expressed immediate knock down effect and all other insecticidal treatments showed their superiority to manage aphid population over untreated control (17.83). The treatments T_1 - T_6 showed superior results reflecting the pest population below ETL up to the next spray date. This clearly indicated that ten-days spraying interval is optimum for effective management of rose aphid population.

Present finding is in agreement with some previous workers viz. Chinniah *et al*. (2016) [5] reported that two rounds of chemical applications at 14-day intervals with different doses were effective in reducing the aphid population, whereas Abamectin 1.9 EC @ 125 ml/ha, Thiamethoxam 25 WG @ 100 g/ha, and Diafenthiuron 50 WP @ 600 g/ha were found effective against chilli pest. Similarly, Amin and Islam (2020) concluded that applying of Effectiveness of Liquor 1.8 EC (Abamectin) against gladiolus thrip s was tested @ 1.75, 2.0 (farmers' practice), 2.5 (recommended) and 2.75ml/L water. plant) at 1, 3 and 7 days after treatment. The tested pesticides significantly reduced pest population and the recommended dose of the pesticides revealed higher efficacy than that of farmers.

3.2 Effect of insecticide on thrips population at different day interval

The minimum thrips population was recorded in the treatment T_1 (Abamectin 01.90 EC at five-day interval) (2.74) and observed to be most effective amongst all the other treatments. This treatment was found at par with treatment T_2 (Abamectin 01.90 EC at six-day interval) (3.58). The next promising treatments were treatment T_3 (Abamectin 01.90 EC at seven-day interval) (5.04), treatment T_4 (Abamectin 01.90 EC at eight-day interval) (5.57) and treatment T_5 (Abamectin 01.90 EC at nine-day interval) (6.45). These treatments were also found on par with each other. The next effective treatment was treatment T_6 (Abamectin 01.90 EC at ten-day interval) (9.06) and treatment T_7 (Abamectin 01.90 EC at twelve-day interval) (10.14).

The overall result on cumulative effect of insecticide on thrips population at different day interval showed that Abamectin 01.90 EC at five-day interval expressed immediate knock down effect and all other insecticidal treatments showed their superiority to manage thrips population over untreated control (22.19). The treatments T_1- T_6 showed superior results reflecting the pest population below ETL up to the next spray date. This clearly indicated that ten-days spraying interval is optimum for effective management of rose thrips population.

However, our results are agreement with the results of Manju *et al*. (2013) reported that among the new chemicals, Abamectin 1.9 EC sprays recorded significantly less number of thrips and mites followed by Diafenthiuron 25 WP-Diafenthiuron 25 WP and Fenazaquin 10 EC and Thiamethoxam 25 WG sprays. Similar results were reported by Abhyankar (2003) [1], who examined the performance of newer insecticides for managing pests on roses grown under polyhouse conditions. The study revealed that three applications of Abamectin (0.005%), Imidacloprid (0.01%) and Buprofezin (0.01%) were particularly effective in controlling rose thrip.

Table 1: Cumulative effect of insecticide on aphid population at different day interval

Treat	Treatment	Dosage	No of aphid per leaf on different date of observation								Total	Mean
			26/8/24	2/9/24	9/9/24	16/9/24	23/9/24	30/9/24	7/10/24	14/10/24		
T_1	Abamectin 01.90 EC at five-day interval	0.5ml/lit	1.91 (1.30)	4.33 (2.08)	0.91 (0.95)	3.70 (1.91)	1.03 (0.96)	3.10 (1.74)	3.13 (1.76)	1.90 (1.37)	19.96 (4.46)	2.49 (1.57)
T_2	Abamectin 01.90 EC at six-day interval	0.5ml/lit	2.40 (1.53)	3.70 (1.92)	4.27 (2.06)	5.43 (2.32)	4.30 (2.07)	2.62 (1.60)	2.14 (1.46)	3.50 (1.85)	28.35 (5.32)	3.54 (1.88)
T_3	Abamectin 01.90 EC at seven-day interval	0.5ml/lit	6.50 (2.55)	5.07 (2.24)	6.21 (2.48)	5.02 (2.23)	5.29 (2.28)	4.83 (2.20)	6.00 (2.44)	6.07 (2.46)	44.99 (6.70)	5.62 (2.37)
T_4	Abamectin 01.90 EC at eight-day interval	0.5ml/lit	8.35 (2.88)	6.58 (2.56)	6.73 (2.59)	7.15 (2.67)	3.37 (1.83)	4.00 (1.98)	2.63 (1.59)	7.13 (2.66)	46.00 (6.78)	5.75 (2.39)
T_5	Abamectin 01.90 EC at nine-day interval	0.5ml/lit	10.07 (3.17)	5.37 (2.31)	7.81 (2.79)	1.20 (1.01)	8.71 (2.95)	10.30 (3.21)	4.07 (2.02)	4.35 (2.07)	52.53 (7.24)	6.56 (2.56)
T_6	Abamectin 01.90 EC at ten-day interval	0.5ml/lit	11.00 (3.31)	8.26 (2.87)	5.75 (2.39)	10.96 (3.30)	9.68 (3.11)	6.89 (2.61)	10.27 (3.20)	9.70 (3.11)	72.49 (8.51)	9.06 (3.01)
T_7	Abamectin 01.90 EC at twelve-day interval	0.5ml/lit	12.60 (3.55)	4.59 (2.12)	14.76 (3.84)	8.35 (2.88)	14.25 (3.77)	10.72 (3.27)	6.37 (2.51)	11.47 (3.38)	83.11 (9.11)	10.38 (3.22)
T_8	Abamectin 01.90 EC at fifteen-day interval	0.5ml/lit	11.80 (3.43)	16.90 (4.10)	12.53 (3.54)	12.83 (3.58)	6.23 (2.48)	17.00 (4.11)	10.97 (3.30)	15.89 (3.98)	104.13 (10.20)	13.01 (3.60)
T_9	Untreated control	–	18.57 (4.31)	19.00 (4.32)	17.00 (4.12)	17.20 (4.14)	18.30 (4.28)	20.40 (4.51)	15.43 (3.92)	16.75 (4.09)	142.22 (11.98)	17.83 (4.22)
	F test		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
	S E. (m)		0.14									
	C.D.at 5%		0.40									
	C V		14.35									

Table 2: Cumulative effect of insecticide on thrips population at different day interval

Treat	Treatment	Dosage	No of thrips per leaf on different date of observation								Total	Mean
			26/8/24	2/9/24	9/9/24	16/9/24	23/9/24	30/9/24	7/10/24	14/10/24		
T_1	Abamectin 01.90 EC at five-day interval	0.5ml/lit	2.30 (1.47)	5.70 (2.38)	1.80 (1.28)	4.81 (2.18)	1.80 (1.27)	1.60 (1.26)	2.71 (1.63)	1.25 (1.11)	21.97 (4.68)	2.74 (1.65)
T_2	Abamectin 01.90 EC at six-day interval	0.5ml/lit	1.60 (1.26)	2.80 (1.67)	3.07 (1.74)	5.80 (2.40)	4.47 (2.11)	1.70 (1.30)	4.80 (2.19)	4.43 (2.09)	28.67 (5.35)	3.58 (1.89)
T_3	Abamectin 01.90 EC at seven-day interval	0.5ml/lit	4.80 (2.19)	4.88 (2.20)	5.30 (2.28)	4.91 (2.21)	5.50 (2.34)	4.32 (2.07)	5.33 (2.31)	5.29 (2.28)	40.34 (6.35)	5.04 (2.24)
T_4	Abamectin 01.90 EC at eight-day interval	0.5ml/lit	8.23 (2.87)	5.71 (2.39)	5.30 (2.30)	6.31 (2.51)	3.71 (1.92)	2.40 (1.54)	6.70 (2.58)	6.21 (2.48)	44.56 (6.67)	5.57 (2.36)
T_5	Abamectin 01.90 EC at nine-day interval	0.5ml/lit	10.12 (3.18)	6.50 (2.55)	3.25 (1.79)	2.50 (1.57)	9.01 (3.00)	7.60 (2.76)	8.50 (2.91)	4.14 (2.03)	51.62 (7.18)	6.45 (2.54)
T_6	Abamectin 01.90 EC at ten-day interval	0.5ml/lit	11.65 (3.41)	7.59 (2.75)	3.40 (1.84)	12.80 (3.58)	7.65 (2.76)	5.48 (2.34)	11.83 (3.43)	12.15 (3.48)	72.54 (8.51)	9.06 (3.01)
T_7	Abamectin 01.90 EC at twelve-day interval	0.5ml/lit	10.95 (3.31)	5.86 (2.42)	13.20 (3.63)	7.30 (2.70)	11.73 (3.42)	10.87 (3.29)	7.95 (2.81)	13.25 (3.64)	81.12 (9.00)	10.14 (3.18)
T_8	Abamectin 01.90 EC at fifteen-day interval	0.5ml/lit	13.74 (3.71)	17.89 (4.23)	8.61 (2.93)	15.31 (3.91)	7.31 (2.70)	16.93 (4.71)	9.87 (3.14)	14.70 (3.83)	104.35 (10.21)	13.04 (3.61)
T_9	Untreated control	–	24.03 (4.90)	23.93 (4.88)	22.02 (4.69)	25.06 (5.00)	23.83 (4.87)	22.33 (4.71)	20.33 (4.49)	16.83 (4.09)	177.56 (13.32)	22.19 (4.71)
	F test		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
	S E. (m)		0.15									
	C.D.at 5%		0.43									
	C V		14.58									

3.3 Effect of insecticide on leafhopper population at different day interval

From the present investigation, it is concluded that the minimum pest population was recorded in the treatment T_1 (Abamectin 01.90 EC at five-day interval) (0.27) and observed to be most effective amongst all the treatments. This treatment was found at par with treatment T_2 (Abamectin 01.90 EC at six-day interval) (0.44). The next promising treatment were treatment T_3 (Abamectin 01.90 EC at seven-day interval) (1.06), treatment T_4 (Abamectin 01.90 EC at eight-day interval) (1.14), treatment T_5 (Abamectin 01.90 EC at nine-day interval) (1.23) and treatment T_6 (Abamectin 01.90 EC at ten-day interval) (1.46) which found on par with each other. This is followed by treatment T_7 (Abamectin 01.90 EC at twelve-day interval) (2.01). The overall result on cumulative effect of insecticide on leafhopper population at different day interval showed that Abamectin 01.90 EC at five-day interval expressed immediate knock down effect and all other insecticidal treatments showed their superiority to manage leafhopper population over untreated control (5.77). The treatments T_1- T_6 showed superior results reflecting the pest population below ETL up to the next spray date. This clearly indicated that up to ten-days spraying interval is optimum for effective management of rose leafhopper population.

The results during present investigation was confirmed with the finding of Ayyanar *et al.* (2018) [4] concluded that leaf hopper population is concerned among the seven new insecticide molecules evaluated, Thiamethoxam 25 WG, Abamectin 1.8 EC @ 0.5 ml/l, Diafenthiuron 50 WP @ 1 g/l recorded the maximum % reduction of brown leaf hopper 91.8, 90.7, 87.8 %, respectively, which were statistically at par in their bio efficacy. Similar results were recorded by Mainail *et al.* (2007) evaluate the efficacy of Abamectin and concluded that the bio-rational management of eggplant fruit and shoot borer fruit infestation per cent on number and weight basis was lowest in Abamectin treated plots (17.42 and 16.13) followed by Cypermethrin (29.13 and 27.80), Btk (31.26 and 29.17), Nimbecidine (35.66 and 33.79), Anosom (42.22 and 39.66), CFE (62.94 and 60.02) and untreated check (75.84 and 73.58), respectively. Efficacy of the treatments could be arranged in the order Abamectin > Cypermethrin > Btk > Nimbecidine > Anosom > CFE > Untreated check. The treatment Abamectin was superior in terms of lowest fruit infestation by number.

3.4 Effect of insecticide on mite population at different day interval

It was concluded that the minimum mite (*Tetranychus cinnabarinus*) population was recorded in (Table no 4) the treatment T_1 (Abamectin 01.90 EC at five-day interval) (3.24) and observed to be most effective amongst all the treatments. This treatment was found at par with treatment T_2 (Abamectin 01.90 EC at six-day interval) (3.72). The next promising treatment were treatment T_3 (Abamectin 01.90 EC at seven-day interval) (5.82), treatment T_4 (Abamectin 01.90 EC at eight-day interval) (6.60), treatment T_5 (Abamectin 01.90 EC at nine-day interval) (6.75) and treatment T_6 (Abamectin 01.90 EC at ten-day interval) (8.30). These treatments were also found on par with each other. The next effective treatment was treatment T_7 (Abamectin 01.90 EC at twelve-day interval) (11.84) and treatments T_8 (Abamectin 01.90EC at fifteen-day interval) (15.05). The overall result on cumulative effect of insecticide on mite population at different day interval showed that Abamectin 01.90 EC at five-day interval expressed immediate knock down effect and all other insecticidal treatments showed their superiority to manage mite population over untreated control (23.62). The treatments T_1-T_8 showed superior results reflecting the pest population below ETL up to the next spraying date. This clearly indicated that up to fifteen-days spraying interval is optimum for effective management of rose mite population.

The present investigation results indicated the effectiveness of Abamectin 01.90 EC @ 0.5ml/lit at five-day interval against the mite which was supported by the report of Jasmine *et al*. (2008) studies, they reported that abamectin 1.9 EC was more effective than the standard checks viz., Triazophos 40 EC 500 g.a.i./ha and Dicofol 18.5 EC 250 g.a.i. /ha. On the basis of pre-post treatment observations on live two spotted spider mite at 3, 5, 7, 10 and 14 days after each spray, abamectin 1.9 EC @ 9.6 and 12.0 g.a.i./ha was found to be more effective in controlling two spotted spider mite and increased the yield. The similar type of results regarding these findings were also reported by, Akashe (2001) [2] who assessed the effectiveness of eleven different acaricides in managing *Tetranychus urticae* on rose plants. Among the treatments, abamectin at 0.00045% proved to be significantly more effective than most other options, with the exception of Clofentezine at 0.006% and Dicofol at 0.05%. The efficacy of the remaining acaricides ranked as follows: Amitraz 0.026% (6.62), Difenthiuron 0.075% (7.28), Triazophos 0.05% (7.65), Flufenuxuron 0.01% (7.71), Novaluron 0.01% (8.09) and Profenofos 0.1% (9.64). These findings are in conformity with the findings of Sudhirkumar and Shelke (2008) [12] assessed the performance of various acaricide Fenpropathrin (0.02%), Wettable sulfur (0.04%), Fenazaquin (0.02%), Abamectin (0.004%), Clofentezine (0.006%), Amitraz (0.02%), Triazophos (0.03%), and Dicofol (0.05%) against *Tetranychus articae*. Among these, abamectin outperformed the rest, achieving the highest control efficacy (91.76%, 91.70%, 91.86%, and 83.58%) and recording the fewest mites per leaf (2.21, 2.19, 2.19, and 4.34) at 1, 3, 7, and 12 days after application. Similar results were recorded by Duchovskiene (2007) [6] who evaluated the abamectin 1.9 EC at three concentration (0.12, 0.1 and 0.08%) against rose mite, *Tetranychus articae* during 2005-2006. Among these three concentrates abamectin 1.9 EC (0.12%) established its superiority by causing 63.5 to 100, 97 to 100, 97.9 to 100 and 79 to 100 per cent mortality at 2 to 3, 5 to 6, 7 to 8 and 12 to 14 days after treatment, respectively.

Table 3: Cumulative effect of insecticide on leaf hopper population at different day interval

Treat	Treatment	Dos age	No of leaf hopper per leaf on different date of observation								Total	Mean
			26/8/24	2/9/24	9/9/24	16/9/24	23/9/24	30/9/24	7/10/24	14/10/24		
T_1	Abamectin 01.90 EC at five-day interval	0.5ml/lit	0.25 (0.50)	0.30 (0.53)	0.13 (0.37)	0.40 (0.63)	0.18 (0.42)	0.25 (0.49)	0.51 (0.71)	0.17 (0.41)	2.20 (1.48)	0.27 (0.52)
T_2	Abamectin 01.90 EC at six-day interval	0.5ml/lit	0.19 (0.43)	0.21 (0.45)	0.61 (0.78)	0.73 (0.85)	0.85 (0.92)	0.17 (0.41)	0.13 (0.36)	0.73 (0.85)	3.58 (1.89)	0.44 (0.66)
T_3	Abamectin 01.90 EC at seven-day interval	0.5ml/lit	0.96 (0.98)	1.00 (1.00)	1.07 (1.03)	0.90 (0.94)	1.13 (1.06)	1.07 (1.02)	0.83 (0.91)	1.60 (1.26)	8.54 (2.92)	1.06 (1.03)
T_4	Abamectin 01.90 EC at eight-day interval	0.5ml/lit	1.22 (1.10)	1.64 (1.28)	1.48 (1.21)	1.02 (1.01)	1.03 (1.01)	1.67 (1.29)	0.37 (0.61)	1.77 (1.33)	9.18 (3.02)	1.14 (1.07)
T_5	Abamectin 01.90 EC at nine-day interval	0.5ml/lit	1.88 (1.37)	1.20 (1.08)	1.88 (1.37)	0.31 (0.55)	1.87 (1.36)	1.75 (1.32)	1.21 (1.10)	0.80 (0.89)	9.88 (3.14)	1.23 (1.11)
T_6	Abamectin 01.90 EC at ten-day interval	0.5ml/lit	1.96 (1.40)	0.42 (0.64)	0.42 (0.64)	1.97 (1.40)	1.43 (1.19)	0.65 (0.80)	2.80 (1.67)	2.08 (1.44)	11.75 (3.42)	1.46 (1.21)
T_7	Abamectin 01.90 EC at twelve-day interval	0.5ml/lit	1.98 (1.41)	0.31 (0.55)	2.70 (1.64)	1.25 (1.11)	2.60 (1.61)	1.95 (1.39)	1.87 (1.36)	3.10 (1.76)	16.11 (4.01)	2.01 (1.41)
T_8	Abamectin 01.90 EC at fifteen-day interval	0.5ml/lit	2.00 (1.41)	4.80 (2.19)	3.04 (1.74)	3.03 (1.74)	1.95 (1.39)	4.57 (2.13)	3.03 (1.74)	3.60 (1.89)	26.01 (5.10)	3.25 (1.80)
T_9	Untreated control	–	5.07 (2.24)	7.80 (2.79)	4.10 (2.02)	6.50 (2.54)	5.27 (2.29)	7.00 (2.46)	4.17 (2.04)	6.35 (2.50)	46.23 (6.79)	5.77 (2.40)
	F test		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
	S E. (m)		0.07									
	C.D.at 5%		0.21									
	C V		13.04									

Table 4: Cumulative effect of insecticide on mite population at different day interval

Treat	Treatment	Dos age	No of mite per leaf on different date of observation								Total	Mean
			26/8/24	2/9/24	9/9/24	16/9/24	23/9/24	30/9/24	7/10/24	14/10/24		
T_1	Abamectin 01.90 EC at five-day interval	0.5ml/lit	3.28 (1.80)	3.00 (1.73)	1.91 (1.37)	3.17 (1.78)	4.71 (2.17)	3.00 (1.71)	4.00 (1.99)	2.92 (1.69)	25.98 (5.09)	3.24 (1.80)
T_2	Abamectin 01.90 EC at six-day interval	0.5ml/lit	2.43 (1.50)	2.70 (1.64)	4.50 (2.11)	5.54 (2.35)	5.80 (2.40)	1.15 (1.07)	3.19 (1.78)	4.46 (2.11)	29.76 (5.45)	3.72 (1.92)
T_3	Abamectin 01.90 EC at seven-day interval	0.5ml/lit	4.13 (2.03)	7.27 (2.69)	5.90 (2.43)	5.90 (2.42)	6.68 (2.58)	4.91 (2.21)	4.31 (2.07)	7.52 (2.74)	46.62 (6.82)	5.82 (2.41)
T_4	Abamectin 01.90 EC at eight-day interval	0.5ml/lit	5.70 (2.38)	8.60 (2.93)	7.79 (2.79)	6.80 (2.60)	5.90 (2.43)	5.15 (2.27)	4.78 (2.18)	8.13 (2.85)	52.86 (7.27)	6.60 (2.57)
T_5	Abamectin 01.90 EC at nine-day interval	0.5ml/lit	7.79 (2.79)	7.35 (2.71)	3.78 (1.94)	2.02 (1.40)	7.74 (2.77)	10.45 (3.23)	9.32 (3.05)	5.59 (2.36)	54.00 (7.34)	6.75 (2.59)
T_6	Abamectin 01.90 EC at ten-day interval	0.5ml/lit	9.58 (3.09)	5.37 (2.31)	3.15 (1.77)	13.20 (3.63)	6.35 (2.52)	5.17 (2.27)	12.80 (3.57)	10.78 (3.28)	66.40 (8.14)	8.30 (2.88)
T_7	Abamectin 01.90 EC at twelve-day interval	0.5ml/lit	10.70 (3.26)	2.63 (1.61)	14.56 (3.81)	9.30 (3.05)	15.45 (3.93)	16.88 (4.11)	9.70 (3.11)	15.50 (3.93)	94.73 (9.73)	11.84 (3.44)
T_8	Abamectin 01.90 EC at fifteen-day interval	0.5ml/lit	10.20 (3.19)	16.00 (4.00)	14.30 (3.78)	18.00 (4.24)	8.28 (2.86)	18.70 (4.32)	17.43 (4.17)	17.50 (4.18)	120.41 (10.9)	15.05 (3.87)
T_9	Untreated control	–	23.00 (4.79)	26.00 (5.09)	22.10 (4.69)	23.70 (4.87)	24.00 (4.90)	21.33 (4.60)	23.63 (4.85)	25.27 (5.02)	189.03 (13.7)	23.62 (4.86)
	F test		Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
	S E. (m)		0.16									
	C.D.at 5%		0.47									
	C V		15.20									

4. Conclusion

From the present investigation, it is concluded that the minimum pest population were recorded in the treatment T_1, this is followed by treatment T_2, treatment T_3, treatment T_4 and treatment T_5. Up to the treatment T_6, all the treatments showed superior results reflecting the pest population below ETL up to the next spraying date. However, in the case of mite infestation it does not crosses the economic threshold level (ETL) at any stage of crop. Though the treatment T_6 showed the pest population below the economic threshold level (ETL) up to the next spraying date. Ten-day spray interval is recommended for the effective management of major sucking pests of rose crop.

5. Acknowledgement

The authors are grateful to Department of Entomology, Post Graduate Institute, Dr. PDKV, Akola, MS, India for providing all the necessary facilities for conducting the present research work.

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