

Original Research Article

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## Seasonal Incidence and Management of Red Spider Mite, *Tetranychus urticae* Koch. Infesting Rose

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### ABSTRACT

#### Keywords

*Tetranychus urticae*, Seasonal incidence, Insecticides, Management.

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Experiments conducted on seasonal incidence of *Tetranychus urticae* Koch. During the year 2013-2014 at the University Farm of Sher-e-Kashmir University of Agricultural Sciences and Technology-Jammu revealed that the incidence of red spider mite, *T. urticae* was 14.40 mites/leaf/plant in the 14<sup>th</sup> standard week and reached its maximum 27.50 mites/leaf/plant in the 12<sup>th</sup> standard week. The mean maximum and minimum temperatures had positive but highly significant effect on thrips population with 'r' values ( $r = 0.721^{**}$  and  $r = 0.768^{**}$ ). The minimum temperature, relative humidity (evening) and rainfall had highly negative significant effect on mite population with 'r' value ( $r = -0.500^{**}$ ,  $-0.684^{**}$  and  $-0.569^{**}$ ), while as maximum temperature and mean relative humidity (morning) had negative effect on the mite population with 'r' values ( $r = -0.014$  and  $-0.219$ ). The relative efficacy of insecticides against *T. urticae* showed that imidacloprid 200SL (0.0025%) was the most effective in reducing the mite population followed by, dimethoate 30EC (0.05%), carbosulfan 25EC (0.03%) and novaluron 10EC (50g a.i/ha). Neem oil (0.05%) was least effective in controlling mite population on rose.

### Introduction

Flowers are symbolic of beauty, love and tranquility. They form soul of garden and convey the message of nature to man. In our country, flowers are sanctified and commonly used in worship both in houses and temples (Rajakumar *et al.*, 2005). Rose (*Rosa* sp.) is one of the nature's beautiful creations and is universally called as 'queen of flower'. The word rose is derived from the name 'Erose' meaning 'the god of love'. In Sanskrit literature, rose is referred as 'Tarunipushpa', 'Atimanjula' and 'Semantika'.

Rose belongs to the family Rosaceae. India has about 88,607 hectare of land under floriculture with a production of 6,80,600 tonnes of flowers (Anonymous, 2000). Among the non-insect pests, mites are the notably notorious pests and gaining tremendous importance in recent years owing to their devastating nature and damage potential. The phytophagous mites belonging to four important families viz., Tetranychidae (spider mites), Tenuipalpidae (false spider mites), Eriophyiidae (gall mites) and Tarsonemidae (broad/ yellow mites)

(Anonymous, 1991). The spider mites generally feed on the lower surface of the leaves as a result the infested leaves initially show speckling and later turn yellowish, finally leading to defoliation. The mites spread to all parts of the plants as the population increases especially during day periods and produce webbing over the entire plants. Moderate population may greatly affect crop production and heavy infestation results in death of the plants (Jeppson *et al.*, 1975). These mites extensively web the top, fresh growth of leaves and unopened flower buds. The infested leaves exhibit a burnt appearance and high leaf fall. Severe infestation of mites causes partial opening of flower buds. Infested flower petals lose their brightness resulting in a direct loss to the grower. Mites cause about 53 per cent damage on rose plants with webbed top canopy (Dhooria, 1999). 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 proposed.

### **Materials and Methods**

Investigations were undertaken during 2013-2014 to study the seasonal incidence of red spider mite at University Research Farm, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. Rose variety "Rose Local" was raised with recommended agronomic practices in the plot size of 3 x 1 m<sup>2</sup> with row to row and plant to plant distance of 45 cm and 20 cm, respectively. Five randomly selected plants from the field were tagged for recording the observations. Observations on seasonal incidence were recorded at weekly intervals, starting from the first appearance (14<sup>th</sup> standard week) of red spider mite in the field. Red spider mite population was counted from five leaves each from top, middle and bottom and their average was taken. For the red

spider mite management, a trial was laid out in the randomized block design with three replications. Six insecticidal formulations including control were tested as given below. Observations on the red spider mite population from the selected plants were recorded before and after 1, 7 and 15 days of spray. Data thus obtained were analysed statistically and the efficacy of the insecticides were worked out.

- T1- Neem oil @ 0.05%
- T2- Novaluran10EC @ 50g a.i/ha
- T3- Carbosulfuran 25EC @ 0.03%
- T4- Imidachlopid 200SL @ 0.0025%
- T5- Dimethoate 30EC @ 0.05%
- T6- Control

### **Results and Discussion**

#### **Seasonal Incidence of *T. urticae* Koch.**

The data regarding seasonal incidence of red spider mite on rose during 2013-2014 (Table 1 and Fig. 1) revealed that incidence of red spider mite on rose leaves, commenced in 14<sup>th</sup> standard week (14.40 mites/leaf/plant) when mean maximum and minimum temperature, mean relative humidity (morning and evening) and rain fall were 31.45 and 13.95°C, 81.00 and 32.00 per cent and 1.10 mm, respectively. The mite population ranged from 0.00 to 27.50 mites/leaf/plant. The mites population increased from 14<sup>th</sup> (14.40 mites/leaf/plant) to 18<sup>th</sup> standard week (23.39 mites/leaf/plant) and reached its peak (27.50 mites/leaf/plant) during 52<sup>nd</sup> standard week, when mean maximum, minimum temperature, mean relative humidity (morning and evening) and rainfall were 18.20 and 3.00°C, 95.40 and 49.90 per cent and 0.60 mm, respectively. Thereafter, mite population declined and reached to 25.30 mites/leaf/plant during 12<sup>th</sup> standard week when mean maximum, minimum temperature, mean relative humidity (morning and evening) and

rainfall were 50.05 and 18.61 °C, 65.53 and 34.67 per cent and 1.02 mm, respectively. Correlation matrix (Table 2) between seasonal incidence of mites and prevailing weather factors revealed that minimum temperature, relative humidity (evening) and rainfall had highly negative significant effect on mites population with 'r' values ( $r = -0.500^{**}$ ,  $-0.684^{**}$  and  $-0.569^{**}$ ) respectively. On the other hand maximum temperature and relative humidity (morning) had negative effect on mites population with 'r' values ( $r = -0.014$  and  $r = -0.219$ ), respectively.

Regression studies for the effect of abiotic factors on the build-up of mites population was significantly influenced by weather factors, their contribution being 74.80 per cent during 2013-2014, respectively. Our results are in agreement with that of Butani (1974), who reported that September to January was the active season for mites on rose under field condition. Sudharma *et al.*, (1995), also reported that mite population again increased from April 07 and reached a peak during second fortnight of May 07 due

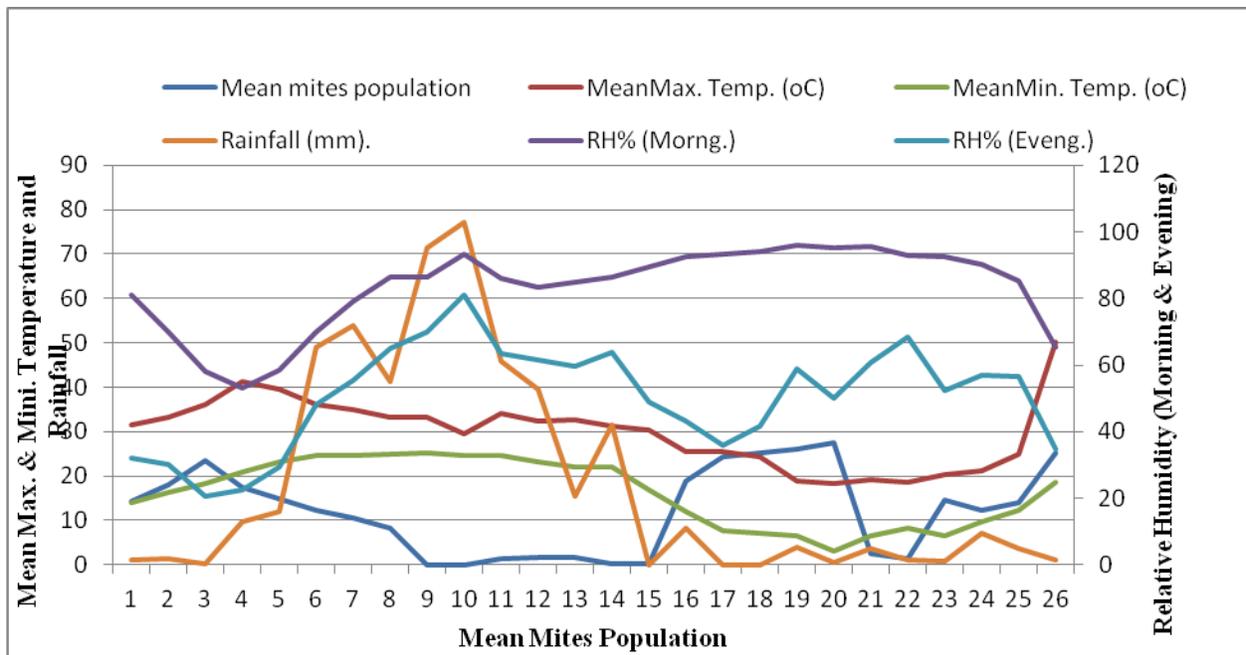
to high temperature and these results are in conformation with our results. Similar results were reported Onkarappa, (1999).

**Management of *T. urticae* Koch.**

**First spray**

Efficacy of the insecticides for the management of the pest revealed that all the insecticidal treatments at 1, 7 and 14 days after spray were superior to control in reducing the pest population (Table 3). The observations recorded on 3<sup>rd</sup> day after spray revealed that all the treatments proved significantly superior over control. Imidacloprid (5.11 mites/leaf/plant) was found to be most effective treatment in reducing the mites population which was at par with dimethoate (9.15 mites/leaf/plant). The next best treatment was carbosulfuran (6.78 mites/leaf/plant) and novaluran (7.72 mites/leaf/plant). Neem oil (8.42 mites/leaf/plant) was found to be least effective against the mites.

**Fig.1** Seasonal incidence of red spider mite, *T. urticae* Koch. During 2013-2014



**Table.1** Seasonal incidence of population on rose during 2013-14

Standard weeks	Mean mites population	MeanMax. Temp. (°C)	MeanMin. Temp. (°C)	RH% (Morng.)	RH% (Eveng.)	Rainfall (mm).
14	14.40	31.45	13.95	81.00	32.00	1.10
16	18.10	33.15	16.20	70.00	30.00	1.20
18	23.39	36.10	18.40	58.00	20.50	0.20
20	17.45	41.30	20.75	53.00	22.50	9.60
22	14.97	39.50	23.25	58.50	29.50	12.00
24	12.27	36.10	24.55	70.00	48.00	48.90
26	10.64	35.05	24.75	79.00	55.50	53.90
28	8.34	33.25	24.90	86.50	65.00	41.30
30	0.00	33.30	25.30	86.50	70.00	71.55
32	0.00	29.55	24.60	93.50	81.00	77.30
34	1.27	34.10	24.70	86.00	63.50	46.00
36	1.67	32.40	23.05	83.50	61.50	39.65
38	1.76	32.70	21.95	85.00	59.50	15.55
40	0.05	31.15	21.95	86.50	64.00	31.40
42	0.10	30.40	16.85	89.50	49.00	0.00
44	18.96	25.60	12.00	92.50	43.00	8.30
46	24.31	25.35	7.70	93.50	36.00	0.00
48	25.32	24.40	7.05	94.00	41.50	0.00
50	26.10	19.00	6.55	96.00	59.00	3.90
52	27.50	18.20	3.00	95.40	49.90	0.60
02	2.42	19.10	6.50	95.80	60.60	3.70
04	1.34	18.50	8.10	92.80	68.50	1.00
06	14.54	20.30	6.50	92.70	52.40	0.70
08	12.21	21.30	9.70	90.30	56.90	7.10
10	14.07	24.90	12.40	85.40	56.50	3.70
12	25.30	50.05	18.61	65.53	34.67	1.02
<b>Range</b>	<b>0.00-27.50</b>	<b>18.20-50.05</b>	<b>3.00-25.30</b>	<b>53.00-96.00</b>	<b>20.50-81.00</b>	<b>0.00-177.30</b>
<b>Mean±SEm</b>	<b>13.39±1.60</b>	<b>29.85±1.55</b>	<b>16.28±1.46</b>	<b>83.09±2.50</b>	<b>50.40±3.08</b>	<b>22.30±7.44</b>

**Table.2** Correlation matrix showing relationship between thrips, *T. urticae* and various abiotic factors during 2013-2014

	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>
Y <sub>1</sub>	-0.014	-0.500**	-0.219	-0.684**	-0.569**

\* Correlation is significant at 0.01 level

\*\*Correlation is significant at 0.05 level

### Regression Model

$$Y_1 = 38.516 + 0.666X_1 - 1.762X_2 - 0.018X_3 - 0.421X_4 + 0.280X_5 \quad (R^2 = 0.748)$$

Where,

Y<sub>1</sub>= Mean mites population

X<sub>1</sub>= Maximum temperature (°C)

X<sub>2</sub>= Minimum temperature (°C)

X<sub>3</sub>= Mean relative humidity morning (%)

X<sub>4</sub>= Mean relative humidity evening (%)

X<sub>5</sub>= Rainfall (mm)

**Table.3** Efficacy of different insecticides against mites population on rose during 2013-14

Treatments	Mean mites population/leaf/plant							
	1 <sup>st</sup> spray				2 <sup>nd</sup> spray			
	1DBS*	1DAS	7DBS	15DAS	1DBS	1DAS	7DBS	15DAS
Neem oil	18.60 (4.3)	9.15 (3.10)	6.91 (2.72)	7.97 (2.91)	8.67 (3.02)	4.34 (2.20)	3.74 (2.05)	1.99 (1.57)
Novaluran10 EC	18.43 (4.35)	8.42 (2.98)	6.56 (2.55)	7.61 (2.84)	9.21 (3.11)	4.23 (2.17)	3.33 (1.95)	1.78 (1.50)
Carbosulfan 25 EC	18.32 (4.33)	7.72 (2.86)	6.02 (2.55)	7.31 (2.79)	8.18 (2.94)	3.78 (2.06)	2.95 (1.85)	1.56 (1.43)
Imidachloprid 200 SL	17.32 (4.22)	5.11 (2.36)	4.19 (2.16)	6.76 (2.69)	7.34 (2.80)	2.59 (1.75)	1.13 (1.27)	0.67 (1.08)
Dimethoate 30 EC	17.67 (4.26)	6.78 (2.69)	5.89 (2.52)	6.90 (2.72)	7.56 (2.83)	3.11 (1.90)	2.58 (1.75)	1.19 (1.30)
Control	19.11 (4.42)	20.02 (4.52)	22.67 (4.81)	23.78 (4.92)	24.23 (4.97)	25.01 (5.05)	25.99 (5.14)	26.67 (5.21)
<b>CD (p ≤ 0.05)</b>	<b>2.89</b>	<b>2.95</b>	<b>2.38</b>	<b>2.35</b>	<b>1.61</b>	<b>1.86</b>	<b>1.34</b>	<b>1.36</b>

\*DBS – Days before spray, DAS – Days after spray

Figures in parenthesis are  $\sqrt{x} + 0.5$  transformed values

The observations recorded on 7<sup>th</sup> day after spray revealed that all the treatments proved significantly superior over control. Imidacloprid (4.19 mites/leaf/plant) was found to be most effective treatment in reducing the mites population which was at par with dimethoate (5.89 mites/leaf/plant). The next best treatment was carbosulfuran (6.56 mites/leaf/plant) and novaluran (6.02 mites/leaf/plant) and finally neem oil (6.91 mites/leaf/plant). On 15<sup>th</sup> day after spray revealed that all the treatments proved significantly superior over control. Imidacloprid (6.76 mites/leaf/plant) and dimethoate (6.90 mites/leaf/plant) were found best treatment in reducing the thrips population which were at par with each other. The next best treatment was carbosulfuran (7.31 mites/leaf/plant) and novaluran (7.61 mites/leaf/plant). Neem oil (7.97 mites/leaf/plant) was found to be least effective against the mites.

### **Second spray**

Efficacy of the insecticides for the management of the pest revealed that all the insecticidal treatments at 1, 7 and 14 days after spray were superior to control in reducing the pest population (Table 3). The observations recorded on 3<sup>rd</sup> day after spray revealed that all the treatments proved significantly superior over control. Imidacloprid (2.59 mites/leaf/plant) was found to be most effective treatment in reducing the mites population which was at par with dimethoate (3.11 mites/leaf/plant). The next best treatment was carbosulfuran (3.87 mites/leaf/plant) and novaluran (4.23 mites/leaf/plant). Neem oil (4.34 mites/leaf/plant) was found to be least effective against the mites. The observations recorded on 7<sup>th</sup> day after spray revealed that all the treatments proved significantly superior over control. Imidacloprid (1.13 mites/leaf/plant) was found to be most

effective treatment in reducing the mites population which was at par with dimethoate (2.58 mites/leaf/plant). The next best treatment was carbosulfuran (2.95 mites/leaf/plant) and novaluran (3.33 mites/leaf/plant). The least effective insecticide against thrips was Neem oil (3.74 mites/leaf/plant). On 15<sup>th</sup> day after spray revealed that all the treatments proved significantly superior over control. Imidacloprid (0.67 mites/leaf/plant) and dimethoate (1.19 mites/leaf/plant) were found best treatment in reducing the thrips population which were at par with each other. The next best treatment was carbosulfuran (1.56 mites/leaf/plant) and novaluran (1.78 mites/leaf/plant). Neem oil (1.99 mites/leaf/plant) was found to be least effective against the mites. Ours results are in agreement with earlier report of Nair *et al.*, (1990) who have also observed that dimethoate (0.1%) was effective in recording the less population of mite on rose in pot culture experiment. On the contrary Dhooria (1999) had reported that dimethoate (2%) was less effective in reducing the population of mite in rose under field condition. This might be due to the change in the experimental conditions.

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