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# Chemical control of two spotted spider mite *Tetranychus urticae* (Acari: Tetranychidae) on rose under polyhouse conditions

**Sarbmeet Singh, RS Rana, KC Sharma, Aarti Sharma and Arvind Kumar**

**Abstract**
Rose is an ornamental plant of great commercial value and large number of insect pest attacks its cultivation. Among them two-spotted red spider mite *Tetranychus urticae* Koch is a ubiquitous species present worldwide and considered a key pest for rose and other ornamental plants. Nymphs and adults of the mite feed with chelicerate type of mouthparts which pierce and suck the cell sap from epidermis of leaves. Webbing around flowers can be seen after the heavy attack of the mite. An experiment was conducted to evaluate bio-efficacy of six pesticides against red spider mite on rose under poly house conditions. Fenazaquin at 0.0025% concentration was found to be most effective while HMO at 0.5% concentration was least effective in control of the two spotted spider mite. The order of effectiveness of treatments based on per cent reduction of mite were fenazaquin (0.0025%) > propargite (0.0057%)> HMO (2.5%)> dimethoate (0.03%)> HMO (2%) > dicofol (0.05%)> imidacloprid (0.015%)> HMO (1.5%)> HMO (1%)> HMO (0.5%), respectively.

**Keywords:** Rose, *Tetranychus urticae*, chemical control

## Introduction
The genus *Rosa* consists of about 120 species and about 20,000 cultivars. Eight of 120 spp. are cultivated which are *Rosa chinensis* (Jacq), *Rosa damascena* (Mill), *Rosa foetida*, *Rosa gallica*, *Rosa gigantea*, *Rosa moschata*, *Rosa multiflora*, and *Rosa wischuriana* Rajashekharappa (2010) [1]. Roses are grown commercially in greenhouses and outdoor nurseries for cut flowers, potted miniature and landscapes.
The profitable cultivation of rose is affected by many factors and among them insect pests attack is very important, of which the greenhouse whiteflies, aphids, scales and thrips cause extensive damage to the rose crop under polyhouse conditions. Among these, the two-spotted red spider mite *Tetranychus urticae* Koch is a ubiquitous species present worldwide on a wide variety of plants. Nymphs and adults feed with chelicerate type of mouthparts which pierce and suck the cell sap from epidermis of leaves Jhansi and Sridhar (2002) [2]. They prefer older leaves of the plant and suck sap from the under surface of the leaves. The leaves develop characteristic whitish or yellowish stippling. Heavy damage may cause leaves turning yellowish in the first instance and then to bronze. The plant may be covered with webbing with stunting growth which reduces the yield and quality of marketable flowers. It is a phytophagous pest that can cause significant yield losses in many agricultural crops including fruits, cotton, vegetables and ornamentals such as roses, carnations, gladiolus Singh (2015) [3]. To develop economically feasible management strategy to reduce unwanted pesticide load in the environment, knowledge on safer pesticides is also very much essential.

## Materials and Methods
Six pesticides viz, dicofol, imidacloprid, propargite, fenazaquin, dimethoate and mineral oils were evaluated for their efficacy against the mobile stages of two-spotted red spider mite on rose under polyhouse conditions at High Tech Polyhouse of the Department of Floriculture and Landscape Architecture University of Horticulture and Forestry Nauni, Solan. The details of the layout of the research experiment and pesticide (miticides and insecticides) used for the studying the efficacy are given in Table 1 and Table 2 respectively.

**Table 1:** Layout of the experiment

| Location | High Tech. polyhouse University of Horticulture and Forestry Nauni |
|---|---|
| Crop & Variety | Rose |
| No. of treatments | 10 |
| Design | RBD |
| Number of replications | 5 |

**Table 2:** Details of the pesticide treatments used against two spotted red spider mite

| Chemical Name | Trade Name | Concentration (%) | Name of Firm | Chemical Formula |
|---|---|---|---|---|
| Dicofol | Difol 18.5 EC | 0.05 | Sulhphur Mills Ltd. Mumbai | $C_{14}H_9Cl_5O$ |
| Imidacloprid | Confidor 17.8 SL | 0.015 | Bayer Industries Ltd. Gujarat | $C_9H_{10}ClN_5O_2$ |
| Propargite | Omit 57 EC | 0.0057 | Dhanuka Agritech Ltd. Udhampur | $C_{19}H_{26}O_4S$ |
| Fenazaquin | Magister 10 EC | 0.0025 | Dupont India Pvt. Ltd. Gurgaon | $C_{12}H_{14}ClNO_2$ |
| Dimethoate | Rogorin 30 EC | 0.03 | Insecticide India Ltd. Chopanki | $C_5H_{12}NO_3PS_2$ |
| Mineral oils | - | 0.5, 0.1, 1.5, 2.0, 2.5 | Balmer Lawri and Co. Ltd. Calcutta | - |

The test pesticides were applied as foliar sprays. Five replications of healthy and highly infested rose plants were taken at random and all the plants were marked. The measured quantities of the pesticides were mixed with small quantities of water and the remaining quantity of water was added to it subsequently to make up the volume as required. Leaves from each treated plants were plucked and brought to laboratory in polythene bags. The pre-treatment counts for mobile stages of the spider mite were made before the application of the pesticides while the post-treatment counts were made after 1, 3, 7 and 10 day of spray. The per cent mortality was calculated as per the formula given below:

$$\text{per cent reduction} = \frac{\text{pre count - post count}}{\text{pre count}} \times 100$$

**Results and Discussion**

Bio-efficacy of six pesticides namely dicofol, imidacloprid, propargite, fenazaquin, dimethoate and HMO was studied under field conditions on rose for the management of two spotted red spider mite. Per cant mortality of the two spotted spider mite has been shown in Table 3 and Figure 1. The details of results are described as follows.

**One day after first spray**

Fenazaquin when applied at 0.0025% concentration was found to be the most effective pesticide giving maximum mortality (33.93%) and was statistically at par with propargite (0.0057%) giving 33.23% mortality and dicofol (0.05%) giving 32.92% mortality. HMO when applied at 2.5% concentration gave 28.90 per cent mortality and was statistically at par with dicofol and HMO when applied at 2 per cent concentration gave 28.65% mortality. Dimethoate (0.03%) gave 28.23% mortality and was statistically at par with imidacloprid. HMO when applied at 1.5 per cent concentration gave 23.09% mortality and was statistically at par with imidacloprid (0.015%) and HMO (1%). Minimum mortality of 12.24% at 0.5% concentration was observed which was statistically at par with HMO when applied at 1 per cent which gave 13.60 per cent mortality.

**Three days after first spray**

After 3 days of spray fenazaquin (0.0025%) was found to be effective giving 58.82% mortality and was statistically at par with propargite (0.0057%) giving 57.63% mortality. HMO at 2.5% gave 55.57% mortality and was statistically at par with fenazaquin (0.0025%) and dimethoate (0.03%) which gave 53.63% mortality. HMO at 2% concentration gave 51.46% mortality followed by dicofol (0.05%) giving 40.79% mortality. Imidacloprid at 0.015% concentration gave 30.81% mortality and was statistically at par with HMO at 1.5% (30.48%). Minimum reduction of population was observed in HMO at 0.5% concentration giving 20.73% mortality and was statistically at par with HMO (1%) with 22.97 per cent mortality.

**Seven days after first spray**

After seven days of spray, similar trend was observed. Again, fenazaquin at 0.0025% concentration recorded significantly the highest mortality of mite (71.65%) and was statistically at par with propargite (0.0057%) which recorded 69.76% mortality. HMO (2.5%) gave 66.63% mortality and was statistically at par with propargite and dimethoate which gave 61.68% mortality. HMO at 2% concentration was found next in order as it registered 48.05% mortality and was at par with imidacloprid at 0.015% concentration giving 45.91 per cent reduction of the population. HMO (0.5%) was found to be the least effective against mite registering 33.92% mortality and was at par with HMO (1%) giving 36.54% mortality.

**Ten days after first spray**

Similar trend was observed in efficacy of pesticides after ten days of application as fenazaquin at (0.0025%) gave 79.37% reduction in the mite population and was statistically at par with propargite (0.0057%) registering 74.81% mortality. Next best treatment was found to be of HMO (2.5%) as it gave 71.31% mortality and was statistically at par with dimethoate (0.03%) and propargite (0.0057%). Imidacloprid at 0.015% concentration registered 63.36% mortality and was found to be statistically at par with HMO (2%) giving 62.49% mortality. Dicofol when sprayed at (0.05%) gave 51.72% reduction in the mite population effective and was followed by HMO (1.5%). HMO at 1% concentration gave 41.77 per cent reduction in the mite population and was statistically at par with HMO at 1.5% and 0.5% concentration.

**Table 3:** Efficacy of different pesticide under polyhouse conditions

| Treatments | Concentration (%) | Per cent reduction of mobile stages at indicated days | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 3 | 7 | 10 | Mean |
| Dicofol | 0.05 | 32.92 (34.89) | 40.79 (39.44) | 44.20 (41.59) | 51.72 (45.98) | 42.40$^{e}$ (40.48) |
| Imidacloprid | 0.015 | 23.09 (28.67) | 30.81 (33.60) | 45.91 (42.63) | 63.36 (52.79) | 40.79$^{e}$ (39.42) |
| Dimethoate | 0.03 | 28.23 (31.99) | 53.63 (47.06) | 61.68 (51.75) | 68.49 (55.86) | 53.00$^{c}$ (46.67) |
| Propargite | 0.0057 | 33.23 (35.11) | 57.63 (49.40) | 69.76 (56.64) | 74.81 (59.94) | 58.85$^{ab}$ (50.27) |
| Fenazaquin | 0.0025 | 33.93 (35.55) | 58.82 (50.10) | 71.65 (57.84) | 79.37 (63.04) | 60.94$^{a}$ (51.63) |
| HMO | 0.5 | 12.24 (20.16) | 20.73 (26.69) | 33.92 (35.52) | 39.31 (38.71) | 26.55$^{g}$ (30.27) |
| HMO | 1 | 13.60 (21.33) | 22.97 (28.56) | 36.54 (37.16) | 41.77 (40.10) | 28.72$^{g}$ (31.79) |
| HMO | 1.5 | 17.52 (24.61) | 30.48 (33.379) | 39.88 (39.132) | 42.82 (40.78) | 32.67$^{f}$ (34.47) |
| HMO | 2 | 28.65 (32.29) | 51.46 (45.77) | 48.05 (43.86) | 62.49 (52.25) | 47.66$^{d}$ (43.56) |
| HMO | 2.5 | 28.90 (32.38) | 55.57 (48.18) | 66.63 (54.69) | 71.31 (57.65) | 55.60$^{b}$ (48.23) |
| Mean | - | 25.23$^{d}$ (29.71) | 42.28$^{c}$ (40.22) | 51.82$^{b}$ (46.08) | 59.54$^{a}$ (50.71) | |

CD (p= 0.05)
Treatments = 2.48
Interval = 1.57
Treatment × interval = 4.97

Among the various treatments, fenazaquin (0.0025%) was found to be superior by registering the highest (60.94%) mortality and it was at par with propargite (0.057%) giving 58.85% mortality followed by imidacloprid (0.015%). HMO at 0.5% and 1% and were found to be less effective against two spotted red spider mite by causing 26.55 and 28.72 per cent mortality. The descending order of effectiveness of treatments was fenazaquin (0.0025%) > propargite (0.0057%) HMO (2.5%)> dimethoate (0.03%)> HMO (2%) > dicofol (0.05%)> imidacloprid (0.015%)> HMO (1.5%)> HMO (1%)> HMO (0.5%). Fenazaquin at 0.0025% concentration was found to be most effective while HMO at 0.5% concentration was least effective in control of the two spotted spider mite.

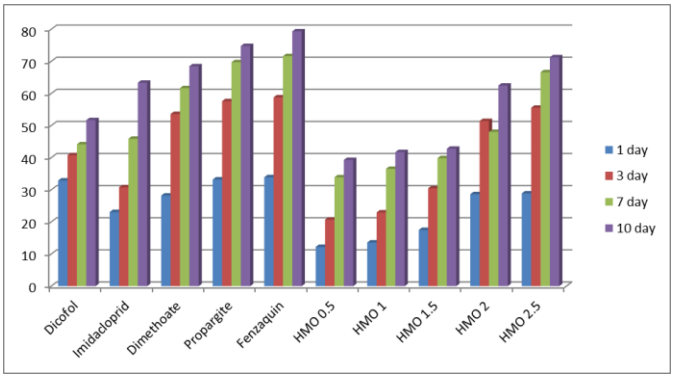


**Fig 1:** Efficacy of different pesticides under polyhouse condition

The results on the reduction in population in the present studies are in agreement to those of Shah and Shukla (2014)[4] and Pokle and Shukla (2015) [5] who reported fenazaquin (0.01%) and propargite (0.05%) to be effective in managing the population of two spotted spider mite in gerbera. Singh *et. el.* (2006) [6] reported imidacloprid (0.04%) against two spotted spider mite under polyhouse conditions in Ludhiana. The present studies are also in agreement with that of Toke (2010) [7] who evaluated the bio-efficacy of some pesticides against *T. urticae* under polyhouse conditions and found that propargite at 0.05% gave 69.19% reduction followed by dimethoate (0.03%) which gave 57.97% mortality. Patil *et. el.* (2014) [8] revealed that propargite (0.05%) was more effective in managing two spotted red spider mite under polyhouse conditions in Gujarat. Reddy *et al.* (2014) [9] found fenpyroximate (1.0 ml/l) and chlorfenapyr (1.5 ml/l) were effective for the control of two spotted spider mite on chrysanthemum in Himachal Pradesh.

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