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Regulation of Spider Mite (*Tetranychus* sp.) Population on Roses[1]

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ABSTRACT

Water blasting (25-30 psi) was equally effective as formetanate hydrochloride spray (0.33 gm a.i/2.5 m2 plot) in reducing spider mite infestation on roses. Neem extract, detergent (Tide powder) and rice hull mulching were not as effective against the pest but were generally better than the untreated control. The highest peso value for cut stem flowers was obtained from water-blasted bushes.

Key Words: *Tetranychus*, spider mite regulation, roses.

INTRODUCTION

The spider mite, *Tetranychus* sp., feeds on the nether surfaces of rose leaves. Initially, mite feeding results to loss of chlorophyll which is manifested as mottled areas on the upper surface of infested leaves. If left uncontrolled, mite infestation causes the leaves to turn yellow and subsequently fall prematurely (Cadatal, 1988).

Although defoliated plants are able to regrow new sets of leaves, further mite re-infestation impairs the productive potential of the rose bush, causing production of short-stemmed, inferior cut stem flowers. Continuous and prolonged defoliation due to such infestation usually shorten the life span of the plants. A healthy, relatively bushier plant can remain productive for as long as 10 years, while mite-harboring plants can live only for 2 years at most.

Prolonged and continuous use of toxicants especially at increased frequencies and/or increased dosages against arthropod pests usually results to the killing of non-target organisms and/or the development of resistant pest populations, as has been shown on citrus trees (Griffiths, 1950) and rice (Cadatal, 1970).

MATERIALS AND METHODS

The experiment was conducted at the senior author's rose garden located at Maligaya Drive, Tuntungin, Los Baños, Laguna, from May-June 1995. The test varieties which are all mite susceptible were a mixture of about 3 feet high, flowering Careless Love, Garden Party, Camelot, Miss America and Red Success. All agronomic practices, namely, watering, organic fertilization and weeding were applied on each of the test plots more or less evenly.

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Treatments. The following treatments were used in the experiment:

(1) Water blasting - where a jet of water passing through a nozzle at 25-30 psi pressure was aimed at the nether surfaces of the leaves of the test rose plants. The purpose was to dislodge eggs, nymphs and adults of the mite.

(2) Neem (*Azadirachta indica)* extract - crude extract of 10 neem leaves was diluted with 1500 ml tap water and sprayed with a knapsack sprayer on the nether surfaces of the leaves of rose plants per treatment. The extract was produced by finely grinding and squashing 30 grams young succulent neem leaves with mortar stone. The inert material of the resulting mixture was squeezed out with fine-meshed muslin cloth to separate the neem crude extract.

(3) Detergent spray - composed of 5.0 gm. of Tide powder laundry soap dissolved in 1500 ml water and knapsack- sprayed on the nether surfaces of the leaves of test rose plants.

(4) Mulching - half-inch thick rice hull were placed on the top soil of the test plot. The covering was maintained adequately by occasional deliberate filling of unmulched sections. Personal observation shows that rice hull mulching causes mites, especially the males, to move about a lot more especially when ambient solar radiation is relatively high. Such behavior would cause the mites to feed less and spend more energy than when they are normally settled on the leaves. Thus, a mulching treatment was also tested in this experiment.

(5) Treated control - as standard check, composed of 1.4 gm of formetanate hydrochloride dissolved in 1500 ml water and knapsack-sprayed on site of mite infestation on test rose bushes;and

(6) Untreated control - where no treatment was applied at all.

Each treatment was applied in a 2.5 m^2 (1m x 2.5m) plot containing 10 test rose bushes and replicated 3 times using RCB Design. Treatments 1, 2, 3 and 5 were applied at 7-day intervals for 7 times. Treatment 4 (rice hull mulching) was maintained all throughout the duration of the experiment.

Prior to field testing of the different treatments, the test roses were left untreated with any chemical miticides for 2 consecutive months, although a 7-10 day interval application of fungicides (Dithane) was done for fungal infection within the same period.

*Mite Population Counts.*Twenty leaflets randomly selected from the test plants per treatment were examined netherly for mite infestation with the use of 10x hand lens. The number of nymphs and adults were counted and recorded separately per leaflet. Counting was done one day before and after each treatment with a parallel count for treatments 4 and 6 for comparison.

*Qualitative degree of damage on roses.*The crop stand was visually observed and damage recorded using a scale of 0-3 based on the level of yellowing or defoliation of the leaves as a result of mite infestation: **0-poor**, when virtually all of the leaves of the test plants are yellowing or defoliated; **1 - mediocre** when slightly over one-half of the total leaf population of the test plants were yellowing or defoliated; **2-good**, when less than half but greater than 1/4 of all of the leaves were yellowing or defoliated; and **3-excellent** when none or less than 1/4 of the leaves were yellowing or defoliated.

Yield. The cut stem roses were harvested at half-open bud stage using a pair of sharp pruning shears at slanting position. The cut was made such that at least two 5-leaflet leaves, with the more apically located one pointing outwardly, were left on the plant. Harvesting was done twice everyday: one in the early morning and the other late in the afternoon. Six cut stem roses were randomly picked and used for yield data. The length of each cut stem was measured and the corresponding price was designated. The shortest cut stems at six-inch long were priced at P3.75 each. Thereafter, a one-inch increment in length increased the price to P2 more up to 14-inch length.

RESULTS AND DISCUSSION

Regulation of Mite Populations. Among the artificial and less toxic measures aimed against the mite, water blasting was consistently very effective in reducing populations of the pest (Table 1). The tactic was comparable in efficiency to the standard insecticide/miticide, formetanate hydrochloride, which likewise suppressed the mite population. Although a 7-day interval water blasting was good enough to considerably reduce mite populations, shortening the duration to 5-day intervals seemed more effective to flush away eggs, newly hatched nymphs, and migrants on the nether surface of the leaves during peak abundance of the pests. The best time to water-blast is about mid-morning when the mites are rather active. Also, at this time solar radiation is high and can exert desiccating effects on dislodged and exposed mites. Likewise, water splashed on the plants can be easily evaporated, reducing chances for rose-pathogenic microorganisms to germinate in the presence of water.

Some appreciable degree of mite reduction was observed with detergent and neem extract spraying when compared with the untreated control. However such reduction was not any better than water-blasted or miticide-treated ones. Furthermore, phytotoxicity was noted on detergent-treated plants. The edges of the burned leaves initially turned water soaked, soft and irregularly curled. In time, the affected leaves dried up and became brittle.

The young succulent leaves of cut stem flowers are relatively susceptible to such form of phytotoxicity, rendering them unsightly and less marketable afterwards.The least effective management tactic against the mites was rice hull mulching where the level of infestation by the pest was very high like the untreated control.

Qualitative degree of damage on roses. In the early part of the trial, there were hardly any differences amongst the different treatments (Table 2) in terms of the crop stand. However, three days after the fourth treatment the crop stand was best in plots that received water blasting and formetanate hydrochloride sprays. That is, the plants were virtually free of yellowing or defoliated leaves because of very low mite infestation. The same was observed two days after the seventh application for the same two treatments.

Yield. The value of the cut stem rose harvests taken one day before the first and third treatment application barely showed any statistical differences (Table 3). Nevertheless, subsequent harvest showed that highest values were obtained from those bushes that were water-blasted followed by formetanate hydrochloride-treated ones, three days after the fourth treatment. The same trend was observed two days

Table 1. Spider mite (*Tetranychus* sp.) density (No./leaflet) on roses under different control treatments.

	TREATMENTS					
OBSERVATION	(1) Water blasting	(2) Neem Spray	(3) Detergent Spray	(4) Mulching	(5) Treated Control	(6) Control
1st						
1DBT*	6.13 a***	6.60 a	7.26 a	6.85 a	7.02 a	6.98 a
1DAT**	1.30 c	6.63 ab	4.43 b	7.50 a	1.32 c	7.22 a
2nd						
1DBT	3.88 c	3.50 c	5.75 b	6.68 b	3.55 c	8.25 a
1DAT	1.78 d	4.36 c	6.18 b	6.70 ab	1.56 d	8.08 a
3rd						
1DBT	3.22 e	4.30 de	6.58 bc	9.28 a	5.13 cd	8.02 ab
1DAT	1.70 d	4.06 c	4.95 b	8.43 a	1.35 d	9.03 a
4th						
1DBT	2.83 c	4.12 c	6.26 b	9.90 a	3.80 c	9.60 a
1DAT	1.68 c	5.15 b	5.30 b	9.65 a	1.35 c	9.90 a
5th						
1DBT	3.66 c	5.16 a	4.82 ab	3.96 bc	4.28 abc	3.65 c
2DAT	1.22 c	6.50 a	4.98 b	4.58 b	1.56 c	5.23 b
6th						
1DBT	1.75 d	7.26 a	5.23 bc	5.55 b	3.93 c	5.28 bc
1DAT	1.05 d	4.43 b	5.92 a	4.30 b	2.35 c	4.10 b
7th						
1DBT	2.32 c	3.08 bc	3.52 ab	4.12 ab	3.60 ab	4.48 a
2DAT	1.63 d	3.42 a	5.73 a	4.43 b	3.18 c	4.66 b

* Day(s) before treatment

** Day(s) after treatment

*** Means followed by the same letter on a row are not significantly different at 5% or 1% level (DMRT).

**** Formetanate hydrochloride - treated = 0.33 gm a.i./2.5 m¨ plot.

Table 2. Damage caused on roses by spider mite (*Tetranychus* sp.) infestation under different control treatments.

	Treatment	Tactics/ Procedure	Damage Rating[1/]		
			2DAIT[2/]	3DA4T[3/]	2DA7T[4/]
1.	Water blasting	25-30 psi	2.3b[5/]	3.3a	3.3a
2.	Neem extract spray	10-leaf extract per 1500 ml water	2.3b	1.6ab	1.3b
3.	Detergent spray	5 gm/1500 ml water	2.6a	1.6ab	1.3b
4.	Rice hull mulch	1/2 inch thick	2.5b	1.0b	1.0b
5.	Treated control[6/]	1.4 gm/1500 ml water	2.3b	3.0a	3.0a
6.	Control	–	2.3b	0.6b	0.3b

1/ Higher number indicates better crop stand
2/ 2 days after first treatment
3/ 3 days after fourth treatment
4/ 2 days after seventh treatment
5/ Means followed by the same letter are not significantly different statistically
6/ Formetanate hydrochloride-treated = 0.33 gm a.i./2.5 m2 plot

Table 3. Yield (in peso) of roses resulting from different treatments against spider mite (*Tetranychus* sp.) infestation.

Treatment	Tactics/ Procedure	IDBIT[1/]	IDB3T[2/]	3DA4T[3/]	2DA7T[4/]
1. Water blasting	25-30 psi	54.61a5	53.5a	59.2a	68.2a
2. Neem extract	10-leave spray extract/ 1500 ml water	53.10a	54.5a	39.2c	33.5e
3. Detergent spray	5 gm/1500 ml water	56.10a	54.5a	42.8c	37.8d
4. Rice hull mulch	1/2 inch thick	55.1a	53.5a	46.2bc	40.2c
5. Treated control[6/]	1.4 gm/1500 ml water	55.1a	54.5a	54.2ab	59.1b
6. Control	-	55.1a	53.2a	36.5c	33.5e

1/ 1 day before the first treatment
2/ 1 day before the third treatment
3/ 3 days after the fourth treatment
4/ 2 days after the seventh treatment
5/ Price value of 6 cut stem roses/treatment based on stem length. Means followed by the same letter are not significantly different statistically.
6/ Formetanate hydrochloride-treated = 0.33 gm a.i./2.5 m2 plot.

before the seventh treatment, with water-blasting and formetanate hydrochloride (treated-control) giving the best value for the cut stem rose harvest. Detergent spray and rice hull mulching caused values for the cut stem flowers that were not as good but were better than no treatment at all.

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