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Evaluation of acaricides against false spider mite, *Tenuipalpus aboharensis* (Acari: Tenuipalpidae), a pest of pomegranate

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ABSTRACT: False spider mites are serious pests of pomegranate and frequently cause considerable economic losses in other fruit crops as well. A field experiment conducted to evaluate eleven acaricides against *Tenuipalpus aboharensis* infesting pomegranate plants, revealed that wettable sulphur at 2.5 g and dicofol at 2.5 ml per litre were very effective and other acaricides *viz.* propargite, fenpyroximate, chlorfenapyr and buprofezin were also found effective against *T. aboharensis*.

KEY WORDS: *Tenuipalpus aboharensis*, chemical control

Pomegranate (*Punica granatum* L.), a member of botanical family Punicaceae is native to central Asia, but since it is highly adaptive to a wide range of climates and soil conditions, it is grown in many different geographical regions including the Mediterranean basin, Asia, and California (Holland *et al*., 2009). It is considered one of the most important fruit crops of the tropical and subtropical region because of low maintenance cost, good yields, keeping quality and ability to thrive with limited moisture (Anonymous, 2005). India produces five lakh tonnes but exports only 5000 tonnes, whereas Spain produces one lakh tonnes and exports 75,000 tonnes and its export ends by December. India has the vast scope to export to European countries from January to June. Pomegranate cultivation is one of the most remunerative farming enterprises in India. It is grown in Maharashtra, Karnataka, Andhra Pradesh and Gujarat on a larger scale, its coverage is about 38,500 ha, whereas in Karnataka its total area is 5,289 ha with an annual production of 30,676 tonnes (Jagadish *et al.*, 1998). It is cultivated mainly in the districts of Tumakuru, Kolar, Bangalore, Mysore, Chitradurga, Dharwad, Vijayapura and Belagavi.

Of several pests which affect the successful production of pomegranate, at least five species of mites are also known to infest the pomegranate plant, these are *Tenuipalpus punicae* Pritchard and Baker, *Tenuipalpus aboharensis* Sadana and Chabra, *Brevipalpus phoenicis* Geijeskes, *Aceria granati* (Canestrini and Massalongi) and *Oligonychus punicae* (Hirst) (Sadana, 1997; Al-Jboory and Al-Swuidy, 2006). The mites infest the younger leaves mainly. Infestation of the tenuipalpid

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mites (*T. punicae, T. aboharensis* and *B. phoenicis*) causes the leaves to turn yellowish and dry; mites are found on the entire lamina, whereas, infestation by the eriophyid (*A. granati*) results in the edges of the leaves to roll. This makes the leaf lamina to become narrower and affects the overall growth of the plant. Occasionally leaf edge rolling is associated with thrips infestation also. Since pomegranate is considered a high-value crop, farmers invest heavily and as a result damage by the pests needs to be addressed. In Karnataka, *T. aboharensis* has been observed as a serious pest of pomegranate during summer period especially in places surrounding Pavagada in Tumakur district and Hiriyur in Chitradurga district. Though no information or data is available on the extent of damage caused due to severe mite infestation, in such situations growers are resorting to application of broad spectrum insecticides. Hence the current study was conducted to determine the effectiveness of available acaricides against this mite.

A field experiment was carried out to evaluate 11 acaricides against *T. aboharensis* on pomegranate (cv. Bhagwa) at Pavagada village, Tumakuru district, 200 km from Bangalore. The experiment was laid out in Randomized Complete Block Design (RBD) with 12 treatments including untreated (water-spray) control in 3 replications (Table 1). The plants were three and half years old, row spacing was 15 feet and plant to plant spacing was 15 feet. Size of the experimental area was 50 m x 50 m with 180 plants. Five plants in a row were considered as a plot for imposing the acaricide treatment. A high volume knapsack sprayer was used for spraying, taking care to cover entire plant including both upper and lower surfaces of leaves. The first spray was carried out during last week of February and the second spray during the first week of May 2008, when the crop had high mite infestation. For recording the observations, from each plant sample of three leaves, one each from the top, middle and bottom canopy were collected and brought to the laboratory in polyethylene bags. The number of eggs and active stages (larvae, nymphs and adults) of *T. aboharensis* on both the surfaces of each of the leaf was recorded under a stereo binocular microscope. *T. aboharensis* population was computed as the mean number of all stages (eggs + active stages) per leaf. The

Table 1. Treatment details of field experiments at Pavagada during Feb. to May 2008

Treatment	Chemical	Dose	Source
T_1	Wettable sulphur	2.5 g/l	Share 40SC
T_2	Dicofol	2.5 ml/l	Colonel 18.5EC
T_3	Abamectin	0.4 ml/l	Abacin 1.9EC
T_4	Fenazaquin	1.7 ml/l	Magister 10EC
T_5	Propargite	1.3 ml/l	Omite 57EC
T_6	Fenpyroximate	0.8 ml/l	Neon 5EC
T_7	Diafenthiuron	1.2 g/l	Pegasus 50WP
T_8	Buprofezin	0.8 ml/l	Applaud 25EC
T_9	Mineral oil	5 ml/l	-
T_{10}	Fish oil Rosin soap	5 g/l	-
T_{11}	Chlorfenapyr	1 ml/l	Intrepid 10EC
T_{12}	Control	Water spray	-

Table 2. Bioefficacy of selected acaricides against *Tenuipalpus aboharensis* on pomegranate

Acaricides	Mean number of mites (eggs + active stages)/leaf				
	First spray				
	Pre- treatment	7 DAS	14 DAS	21 DAS	28 DAS
Wettable sulphur	47.33 (6.85)	20 (4.43)^{a}	10.80 (3.35)^{a}	16.46 (4.09)^{a}	31.93 (5.56)^{a}
Dicofol	86 (9.25)	22 (4.70)^{a}	12.66 (3.61)^{a}	16.86 (4.11)^{a}	29.33 (5.39)^{a}
Abamectin	91 (9.51)	36.93 (5.98)^{a}	19.60 (4.46)^{a}	25.60 (5)^{a}	32.66 (5.04)^{a}
Fenazaquin	111.4 (10.09)	69.53 (7.65)^{ab}	52.13 (6.15)^{ab}	53 (7.06)^{ab}	54.93 (7.11)^{a}
Propargite	35 (6.03)	24.93 (4.96)^{a}	17.86 (4.27)^{a}	27.40 (5.24)^{a}	41.26 (6.39)^{a}
Fenpyroximate	71.80 (7.15)	24.46 (4.86)^{a}	13.06 (3.62)^{a}	21 (4.58)^{a}	29.40 (5.41)^{a}
Diafenthiuron	51.80 (7.15)	26.86 (5.20)^{a}	19.06 (4.37)^{a}	26.66 (5.20)^{a}	43.06 (6.07)^{a}
Buprofezin	74 (8.51)	34.60 (5.76)^{a}	25.86 (4.67)^{a}	42.53 (6.05)^{a}	48.33 (6.21)^{a}
Mineral oil	56.26 (7.52)	31.26 (5.61)^{a}	19.06 (4.48)^{a}	18.06 (4.28)^{a}	33.33 (5.80)^{a}
Fish oil Rosin soap	267.20 (14.45)	189.46 (12.37)^{c}	113.06 (9.74)^{bc}	116.53(10.23)^{bc}	136.66(11.19)^{b}
Chlorfenapyr	80.66 (8.88)	33.40 (5.71)^{a}	26.66 (5.04)^{a}	46.06 (6.60)^{a}	54 (7.16)^{a}
Control	116.66 (10.78)	143.33 (11.93)^{bc}	156.66 (12.49)^{c}	166.66 (12.89)^{c}	173.33 (13.18)^{b}
F test	NS	*	*	*	*
SEM±	(1.86)	(1.57)	(1.28)	(1.11)	(1.25)
CD at P=0.05	-	(4.6)	(3.78)	(3.25)	(3.67)

*DAS: Days After Spray; Figures in parentheses are √(x+0.5) transformed values; NS: Non-significant; *:Significant; Treatments with same alphabetical superscript within the column are statistically on par.*

pretreatment observations were recorded one day before spray and post-treatment observations were recorded on 7th, 14th, 21st and 28th day after spray. In case of second spray, the population was recorded on 7th and 14th day after spray. The mite population data from the field experiment were subjected to √(x+0.5) transformations and analyzed statistically for comparing treatment following Analysis of Variance technique (ANOVA) and the results were interpreted at 5% level of significance.

The present study revealed that all acaricides tested were effective in controlling *T. aboharensis* (Table 2 and 3). General abundance of *T. aboharensis* in the experimental plots was uniform before the imposition of different treatments. Seven days after first spray, wettable sulphur gave the best control followed by dicofol, fenpyroximate, propargite, diafenthiuron, chlorfenapyr, mineral oil, buprofezin and abamectin; however all these were statistically on par, while fenazaquin was not statistically significant from control. Fish oil rosin soap was least effective since the mite population was high. Fourteen days after first spray, the order of effective chemicals was same as those on seven days after spray, only abamectin was better than chlorfenapyr. Twenty-one days after first spray the order of effectiveness was almost similar except that chlorfenapyr was better than fenpyroximate and effectiveness of abamectin was also found improved. Twenty-eight days after first spray abamectin was best whereas wettable sulphur was less effective than dicofol, followed by fenpyroximate, chlorfenapyr, diafenthiuron,

Table 3. Bioefficacy of selected acaricides against *Tenuipalpus aboharensis* (eggs +active stages) on Pomegranate

Acaricides	Mean number of mites (eggs + active stages)/leaf		
	Second spray		
	Pre-treatment	7 DAS	14 DAS
Wettable sulphur	223.46 (14.71)	94.86 (9.68)^{abc}	139.80 (11.71)^{b}
Dicofol	142.26 (11.92)	50.66 (7.06)^{ab}	56.66 (7.53)^{a}
Abamectin	493.73 (21.91)	146.80 (12.04)^{cd}	135.80 (11.61)^{b}
Fenazaquin	171.66 (12.86)	39.53 (6.28)^{a}	67.20 (8.19)^{ab}
Propargite	123.20 (10.73)	50.13 (7.01)^{ab}	48.93 (6.83)^{a}
Fenpyroximate	225.76 (14.89)	103.33 (9.68)^{abc}	80.53 (8.87)^{ab}
Diafenthiuron	382.80 (19.47)	140.60 (11.73)^{bcd}	105.93 (10.17)^{ab}
Buprofezin	171.00 (13.09)	64.60 (7.89)^{abc}	102.46 (10.13)^{ab}
Mineral oil	159.80 (12.64)	73.26 (8.56)^{abc}	80 (8.88)^{ab}
Fish oil Rosin soap	374.53 (18.98)	276.13 (15.71)^{d}	380.20 (19.11)^{c}
Chlorfenapyr	144.06 (11.99)	65.73 (8.02)^{abc}	109.46 (10.46)^{ab}
Control	201.20 (13.80)	241.73 (15.16)^{d}	350 (18.41)^{c}
F test	NS	*	*
SEM±	(1.75)	(1.69)	(1.27)
CD at P=0.05	-	(4.97)	(3.74)

DAS: Days After Spraying; Figures in parentheses are $\sqrt{x}+0.5$ transformed values
*NS: Non-significant ; * Significant*
Treatments with same alphabetical superscript within column are statistically on par

buprofezin, propargite, fenazaquin, mineral oil and were statistically on par. Fish oil rosin soap was observed to be next in the effectiveness; the total number of mites (active stages & eggs) in untreated control was 173.33/leaf (Table 2).

Seven days after second spray fenazaquin and propargite were better, followed by buprofezin, dicofol, chlorfenapyr, mineral oil, fenpyroximate, wettable sulphur; all these were statistically on par, while diafenthiuron and abamectin were not significantly different from control. Fish oil rosin soap was less effective since the mite population was high. Fourteen days after second spray propargite was best, whereas buprofezin was less effective than dicofol followed by fenazaquin, fenpyroximate, chlorfenapyr, mineral oil and diafenthiuron; were statistically on par. Wettable sulphur and abamectin were observed to be next in the order of efficacy. Fish oil rosin soap was again found less effective. The total number of eggs and active stages recorded in untreated control was 551.66 mites/leaf (Table 3).

Among the different acaricides tested, wettable sulphur was found effective on both eggs and active stages up to 21 days after application following the first spray. Dicofol (2.5 ml/litre) was observed as the next best acaricide after wettable sulphur, especially on the active stages after both the sprays. Propargite was found effective on eggs, 7 days after spraying in both sprays. However, all the chemical acaricides were found effective on *T. aboharensis* since the mite population on sprayed plants was

significantly lower than on unsprayed plants. Literature on management of *T aboharensis* is not available and hence the results of management trials on *Brevipalpus phoenicis* which is also a tenuipalpid mite is considered here. Raga *et al.* (1990) tested fenpropathrin, propargite, dicofol, hexythiazox and bromopropylate and found that all were effective against the mite, similar to the results obtained in the present study.

Holland *et al* (2009) found that abamectin, fenpyroximate, spirodiclofen and etoxazole were effective against *B. phoenicis* in Egypt. Sudoi (1990) observed that dicofol was effective on *B. phoenicis* in Kenya. Gowda *et al*. (2007) found that wettable sulphur, dicofol and profenophos were effective against arecanut red mite *Raoiella indica* Hirst, which agrees with the present findings with regard to the effectiveness of wettable sulphur and dicofol.

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