

Original Research Article

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Efficacy of Insecticides on Mites in Grape

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ABSTRACT

Mites pose an increasing threat to grape cultivation in grape growing areas in Telangana and Andhra Pradesh causing heavy loss in the field. Mites which are minor pests earlier in grapes have become serious, particularly before harvest of the crop in the recent years. Two species viz., *Tetranychus urticae*, and *Eutetranychus orientalis* are found causing damage to grapevine both in Telangana and Andhra Pradesh. Among them, the two spotted red spider mite *T. urticae* causes severe loss. The present studies on population dynamics of mites in grape and their management were conducted at Grape research station, Rajendranagar, Hyderabad, during 2011-13. Studies on management of mites in grape were conducted in a completely randomized block design with seven treatments. The treatments include Abamectin @ 0.30 ml/l, Dicofol @ 2 ml/l, Sulphur @ 2 g/l, Fenpyroximate @ 1 ml/l, Spirotetramat @ 0.5 ml/l, Difenthurion 50 SC @ 0.80 ml/l and Control. Among the tested treatments Abamectin @ 0.30 ml/l was effective in the management of mites with 80.65 percent reduction of mites over control followed by Spirotetramat @ 0.5 ml/l with 78.5 percent reduction of mites over control. During 2012-13 Abamectin 0.5ml/lit was effective followed by Spirotetramat@0.5ml/lit with 81.53 and 74.31 percent reduction over control respectively after 10 days of second spray. High volume with high pressure water sprays help to reduce the dust and water stress. Increase the humidity in vineyard and also dislodge the mites from foliage thereby temporarily reducing the mite population.

Keywords

Grape, Mites,
Insecticides,
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Introduction

Grape (*Vitis vinifera* L.) is one of the most important fruit crops of temperate zone which has acclimatized to tropical and sub-tropical agro climatic conditions. Grape is fairly good source of minerals like calcium, phosphorous, iron and vitamins like B₁ and B₂. Fresh and dried fruits have various uses in Ayurvedic and Unani medicine. At present grape is cultivated in an area of 45,200 ha with an annual production of 10.57 lakh tones in India

(Mani, 2014). More than 85 species of insects have been reported in grapevine in India. Mites numbering 41 and nematodes numbering 113 were recorded as pest of grapes. More than 100 pests are known to attack the grapes in India (Butani, 1979).

Sunitha, 2017 reported that three species of mites viz., *Tetranychus urticae*, *T. cinnabarinus*, *T. Euttetranychus orientalis* are found causing damage to grapevine in India. Among them, the two spotted red spider mite

T. urticae causes severe loss in Maharashtra, Karnataka and Andhra Pradesh.

Six species of mites viz., *Tetranychus urticae* Koch, *T. cinnabarinus* Boisduval, *T. neocoleonicus* Andre, *Oligonychus managiferus* Rahmen and Sapra, *O. punicea* Baker and *Eutetranychus orientalis* Klein are found causing damage to grapevine in India (Anonymous., 2008).

Out of these the infestation of *Tetranychus urticae* is reported to be quite considerable in abundance and damage designating is as emerging sucking pests of grape these days (Chandra Sekhar *et al.*, 2008). It has been confirmed recently (Veerendra *et al.*, 2014) that *Tetranychus urticae* relish the grapes in terms of their bionomics supporting continued pestiferousness.

Now it is known to cause severe yield loss both qualitatively and quantitatively through direct effects like loss of chlorophyll, stunting of growth, stippling, webbing, leaf yellowing, defoliation, leaf burning, reduction in size and quality of fruits and appearance of various types of plant deformities.

McDaniel spider mite (*Tetranychus mcdaneli*), Two-spotted spider mite (*Tetranychus urticae*), Willamette spider mite (*Eotetranychus willametei*), Yellow spider mite (*Eotetranychus carpini borealis*) are the different mites occurring in the grape gardens of pacific North West. Spider mites are not often a problem in low chemical input vineyards or with the use of "soft chemicals." Multiple applications of sulfur for disease management (more than five per season) tend to increase incidence and severity of spider mite problems by inhibiting the function of predators, particularly predatory mites (Phytoseiidae).

Grape rust mite (*Calepitrimerus vitis* Nalepa), an Eriophyid mite species, is known to be

problematic in some grape-growing regions of the Pacific Northwest. Grape rust mites are obligate pests of *Vitis vinifera* grapes. Because of their economic damage potential, the mite now holds a permanent pest status in many grape-growing regions of the world including Germany, France, Spain, Switzerland, Italy, Brazil, Australia, and the Pacific Northwest of the USA (Bernard *et al.*, 2005; Duso *et al.*, 2010; Walton *et al.*, 2007). Mites are most effectively moved by wind, followed by movement from vineyard laborers (Duso *et al.*, 2010; Michalska *et al.*, 2010).

Sanitation is to be maintained for eliminating the sources of the mite infestation. Spider mite outbreaks frequently occur where vines are dusty or stressed. Proper irrigation scheduling reduces the water stress and also increases the humidity thereby reducing the mite population. High volume with high pressure water sprays help to reduce the dust and water stress, increase the humidity in vineyard and also dislodge the mites from foliage thereby temporarily reducing the mite populations. The fungi *Beauveria bassiana*, *Verticillium lecanii*, *Hirsutella thompsonii* and *Pacilomyces fumosoroseus* are known to cause mortality in mites.(Kulkarni *et al.*, 2008).

Materials and Methods

A field experiment was conducted on commercial thompson seedless variety from 2011-13 at Grape Research Station, Rajendranagar, Sri Konda Laxman Telangana State Horticultural University, Hyderabad to evaluate the efficacy of insecticides in the management of mites in grape. The experiment was conducted in a completely randomized block design with seven treatments. The treatment and three replications include Abamectin @ 0.50 ml/l, Dicofol @ 2.5 ml/l, Sulphur @ 2 g/l, Fenpyroximate @ 1 ml/l, Spirotetramat @ 0.5 ml/l, Difenthurion 50 SC @ 0.80 ml/l and Control. The first spray was given

immediately after the incidence of mite infestation was observed and second spray was given one week after the first spray. Two applications were targeted against mites (December to March) since the onset of their incidence. The observations were recorded on incidence of mites a day before and after one, five and ten days after each application. The mite population recorded was on per leaf basis and presented as mites /four leaves. The numbers of vines /treatment were five and cane /vine were three.

The total number of leaves considered for recording mites was nine/cane which were selected randomly. The 7x magnifier hand lens was convenient to count the mites accurately. The berry yield was accounted kg/vine and tons/ha. The data on mites was to $(x+0.5)$ before subjecting to analysis. The percent reduction over control was calculated for each insecticide and the data was subjected to statistical analysis.

Results and Discussion

Mites become more active in the month of February and the peak infestation is observed in March. Irrigation practices highly influence the development of mites. Drought stressed plants are most prone to mite outbreaks. Pest is highly active during summer months. There is outbreak of mites in hot dry conditions. High humidity and rainfall reduces mite numbers. Spider mite outbreaks frequently occur where vines are dusty or stressed. Proper irrigation scheduling reduces the water stress and also increases the humidity thereby reducing the mite population.

During 2011-12 and 2012-13 the percent reduction of mite population in various treatments was significant at each interval of observation (5, 10 days after first and second sprays).

Percent population reduction after 5 days after the first spray

During 2011-12 all the treatments were significantly superior over the control in reducing the mite population after 5 days of first spray. The treatment with Abamectin 0.5ml/lit was effective followed by Fenpyroximate@1.0ml/lit with 64.76 and 61.43 percent reduction over control respectively after 5 days of first spray.

During 2012-13 the treatment with Abamectin 0.5ml/lit was effective followed by Fenpyroximate@1.0ml/lit with 81.53 and 74.31 percent reduction over control respectively after 5 days of first spray.

Percent population reduction after 10 days after the first spray

Among all the treatments Abamectin 0.5ml/lit was effective followed by Fenpyroximate@1.0ml/lit with 63.20 and 58.32 percent reduction over control respectively after 10 days of second spray. During 2012-13 Abamectin 0.5ml/lit was effective followed by Fenpyroximate @1.0ml/lit with 80.92 and 74.54 percent reduction over control respectively after 10 days of second spray.

Percent population reduction after 5 days after the second spray

All the treatments were significantly superior over control after second spray. Among all the treatments Abamectin 0.5ml/lit was effective followed by Spirotetamat@0.5ml/lit, Difenthiuron, Fenpyroximate, Sulphur and Dicofol after 5 days of second spray.

Among all the treatments Abamectin 0.5ml/lit was effective followed by Spirotetamat @ 0.5ml/lit with 80.65 and 79.97 percent reduction over control respectively

after 10 days of second spray. During 2012-13 Abamectin 0.5ml/lit was effective followed by Spirotetamat@0.5ml/lit with 81.53 and 74.31 percent reduction over control respectively after 10 days of second spray.

Among the tested treatments Abamectin @ 0.30 ml/l was effective in the management of

mites with 80.65 percent reduction of mites over control followed by Spirotetamat @ 0.5 ml/l with 78.5 percent reduction of mites over control. During 2012-13 Abamectin 0.5ml/lit was effective followed by Spirotetamat@0.5ml/lit with 81.53 and 74.31 percent reduction over control respectively after 10 days of second spray (Table 1 and 2).

Table.1 Efficacy of different insecticides on mites in Grape (2011-13)

Sl.No	Treatment	Mites/leaf/Vine Precount			Percent reduction over control (after 1 st spray)			Percent reduction over control (after 1 st spray)		
		(2011-12)	(2012-13)	Mean	5 DAS		Mean	10 DAS		Mean
				(2011-13)	(2011-12)	(2012-13)	(2011-12)	(2012-13)	(2011-12)	(2012-13)
1	Abamectin 1.9% EC 0.30ml/lit	39.41	42.47	40.94	64.76 ^a	81.53 ^a	73.14	63.20 ^a	80.92 ^a	72.06 ^a
		(6.34)	(6.59)	(6.46)	(53.57)	(64.57)	(59.18)	(52.65)	(64.08)	(58.36)
2	Dicofol 18.5% EC 2 ml/lit	42.85	42.20	42.52	49.90 ^e	65.79 ^d	35.34	49.31 ^d	67.26 ^c	58.28 ^c
		(6.62)	(6.57)	(6.59)	(44.92)	(54.21)	(49.56)	(44.58)	(55.14)	(49.86)
3	Sulphur 80% WP 2 g/lit	39.05	40.87	39.96	52.73 ^d	51.81 ^e	52.27	52.94 ^c	54.47 ^d	53.70 ^d
		(6.32)	(6.45)	(6.38)	(46.55)	(46.01)	(46.28)	(46.67)	(47.55)	(47.11)
4	Fenpyroximate 5% SC 1 ml/lit	40.69	42.40	41.54	61.43 ^b	74.31 ^c	67.87	58.32 ^b	74.54 ^b	66.43 ^b
		(6.45)	(6.58)	(6.51)	(51.60)	(59.54)	(55.57)	(49.77)	(59.71)	(54.74)
5	Spirotetramat 120 OD 0.50ml/lit	38.81	42.07	40.44	58.43 ^c	68.45 ^d	63.44	53.88 ^c	69.74 ^c	61.81 ^c
		(6.30)	(6.56)	(6.43)	(49.84)	(55.80)	(52.82)	(47.20)	(56.61)	(51.90)
6	Difenthiuron 50% WP 0.50g/lit	42.26	42.40	42.33	60.86 ^b	78.07 ^b	69.46	53.56 ^c	79.04 ^a	66.30 ^b
		(6.57)	(6.58)	(6.57)	(51.26)	(62.07)	(56.66)	(47.03)	(62.74)	(54.88)
7	Untreated control	40.43	39.70	40.06	-	-	-	-	-	-
		(6.43)	(6.37)	(6.40)						
	CD(5%)	N.S.	NS	NS	2.21	3.81	3.01	1.79	3.91	2.85
	SEM	0.15	0.19	0.17	0.74	1.69	1.22	0.60	1.73	1.16
	CV	3.28	3.59	3.44	3.47	3.63	3.55	2.91	3.68	3.30

*values in parenthesis are square root transformed

Table.2 Efficacy of different insecticides on mites in Grape (2011-13)

Sl. No	Treatment	Percent reduction over control (after 2nd spray)			Percent reduction over control (after 2nd spray)			Yield(t/ha)		
		5 DAS		Mean	10 DAS		Mean	(2011-12)	(2012-13)	Mean (2011-13)
		(2011-12)	(2012-13)	(2011-13)	(2011-12)	(2012-13)	(2011-13)			
1	Abamectin 1.9% EC 0.30ml/lit	78.53 ^a (62.42)	80.92 ^a (64.08)	79.72 (63.25)	80.65 ^a (63.89)	96.04 ^a (78.96)	88.34 (71.42)	24.77	26.54	25.65
2	Dicofol 18.5% EC 2 ml/lit	63.09 ^d (52.58)	67.26 ^d (55.14)	65.17 (53.86)	70.20 ^c (56.9)	72.92 ^c (58.97)	71.56 (57.93)	18.61	17.47	18.04
3	Sulphur 80% WP 2 g/lit	65.66 ^d (54.18)	54.47 ^e (47.55)	60.06 (50.56)	68.83 ^d (56.04)	71.87 ^e (57.99)	70.35 (57.01)	18.79	17.26	18.02
4	Fenpyroximate 5% SC 1 ml/lit	71.78 ^c (57.89)	74.54 ^c (59.71)	73.16 (58.8)	76.13 ^b (60.74)	77.96 ^d (62.09)	77.04 (61.41)	21.36	23.00	22.18
5	Spirotetramat 120 OD 0.50ml/lit	73.34 ^b (58.89)	69.74 ^d (56.61)	71.54 (57.75)	79.97 ^a (63.40)	89.22 ^b (71.03)	84.59 (67.21)	24.20	16.78	20.49
6	Difenthiuron 50% SC 0.8ml/lit	72.11 ^b (58.11)	79.04 ^a (62.74)	75.57 (60.42)	75.55 ^b (60.36)	81.29 ^c (64.38)	78.42 (62.37)	19.81	19.53	19.67
7	Untreated control	-	-	-	-	-	-	14.16	13.86	14.01
	CD	3.43	3.91	3.67	1.60	8.35	4.9	6.28	3.85	5.06
	SEM	1.14	1.73	1.44	0.53	3.70	4.23	2.01	1.23	1.62
	CV	4.66	3.68	4.17	2.07	6.92	4.49	17.25	11.15	14.2

*values in parenthesis are square root transformed

Present studies indicate that the management of mites with acaricides is directly influencing the yield of grape and hence it is very much essential to manage the mites. During the recent years there is change in the emerging pest recent years there is change in the emerging pest scenario due to change in climate. Due to decreased rainfall and increased temperature in all the seasons mites are posing a serious threat to grapes and also other crops as well.

The superiority of abamectin in reducing the mite population was in conformity with the report of Karmate and Chandele (1997) in different crops Chandrashekar *et al.*, (2008)

also considered abamectin as the best insecticide for the management of mites in grapes followed by diferthuron, fenzaquin and spiromecifen.

The efficacy of abamectin and fenzaquin against different phytophagous mites is in conformity with Mani *et al.*, (2003), Anand Kumar (2002), Singh *et al.*, (2004) and Roopa (2005). Abamectin, spirotetramat, Difenthiuron were superior over the old conventional acaricide sulphur. It was reported that dicofol and sulphur were effective against *T. urticae* in grape by Kumar and Sharma (1991), Rao *et al.*, (1995) Patel *et al.*, (1993). In the present study in poor

efficacy of Dicofol and Sulphur may be due to development of resistance.

Among the promising acaricides significantly, highest yield was obtained from Abamectin treatment (25-65 t/ha) followed by Spirotetramat (20.49 t/ha). However all the other acaricides yielded significantly high compared to untreated control in spite of their low activity. Thus the management of mites is very important in issues of economy point of view also.

In conclusion, the mite (*Tetranychus urticae*) is increasing in the recent years though it was a minor problem in the previous years. Among all the treatments for the management of mites in grape two sprays of Abamectin 0.5ml/lit was effective followed by Spirotetramat @0.5ml/lit, Difenthiuron (0.5g/lit), Fenpyroximate (1.0ml /lit). Further there is a scope for residue analysis as grape is a very important crop for export.

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