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Management of coconut perianth mite, *Aceria guerreronis* (Keifer) through nutrition

B. R. LOKESH AND B. S. NANDIHALLI

Department of Agricultural Entomology,
University of Agricultural Sciences, Dharwad -580 005, Karnataka, India.
Email: b_nandihalli@rediffmail.com

Abstract: Investigation on impact of plant nutrition on population build up of coconut perianth mite, *Aceria guerreronis* (Keifer) was carried out at Navalur near Dharwad during 2007-08. Among the different nutrients applied to soil recommended dose of fertilizer (RDF) + full dose of borax + $MgSO_4$ + gypsum + neem cake, RDF + half dose of borax + MgSO4 + gypsum + neem cake and RDF + borax were the most effective and significantly superior treatments by recording 42.10, 36.03 and 34.11 per cent reduction of mite over control. With respect to per cent damaged nuts and grade indices, RDF + full dose of borax + $MgSO_4$ + gypsum + neem cake, RDF + $MgSO_4$, RDF + half dose of borax + $MgSO_4$ + gypsum + neem cake and RDF + gypsum were the effective treatments and recorded 19.29 to 34.06 per cent damaged nuts and 1.56 to 1.83 damage grading.

Key words : Coconut perianth mite, *Aceria guerreronis*, nutrients, management.

Introduction

Coconut is an important plantation crop susceptible for many pests, of which the coconut perianth mite, *Aceria guerreronis* (Keifer) is the most serious pest. This mite harbours on the fertilized immature nuts. The past experiences of unexpected resistance towards new chemicals, their adverse effect on the environment, shorter period of efficacy and high investment involved in the development of new pesticides, suggest the need for development of alternative control strategies which are sustainable, eco-friendly and economical. Plant nutrients exert pronounced effect on resistance to pests through host plant. Keeping in view the importance of coconut crop and the potentiality of this mite pest to cause extensive damage, the present study was carried out.

Material and methods

A field experiment was conducted at Navalur, Dharwad during 2007-08 to know the effect of soil application of different nutrients and neem products on mite infestation. The palms in the garden were in the age group of 10 to 20 years with a height of 6 to 10 m. The experiment was laid out in a randomized block design with 11 treatments replicated three times. Two plants were selected for each replication. The treatment details are mentioned in table 1. The treatments were imposed twice, first application in July 2007 with half of the dosage and second application in December 2007 with the remaining half dosage.

Three infested nuts from fourth bunch per treatment were collected and brought to the laboratory to observe mite population. From each nut, three inner surface of the perianth attached to the nut and three sliced nut surface areas below the perianth were selected for taking observations. Observations on the mite population at one day before, 3, 6 and 9 months after first soil application of nutrients were recorded using stereo binocular microscope in an area of 28.28 mm^2. Average values of the mite population were worked out and also per cent reduction over untreated control was calculated.

Ten months after the application of nutrients, number of damaged, healthy and total nuts were observed from Percentage of damaged nuts in 5th, 6th, 7th and 8th bunches. Then percentage of damage nuts was calculated based on total number of nuts and infested nuts. The damage of the nut surface was assessed based on zero to five grading as described by Julia and Mariau (1979).

Results and discussion

The data presented in table1 indicated that there was no significant difference among the treatments one day before application of nutrients. Three months after soil application of nutrients, a mixture containing RDF + full dose of borax + $MgSO_4$ + gypsum + neem cake was significantly superior over other treatments in recording less mite population (42.17 mites/28.28 mm2) with highest per cent reduction of mite (38.57%) which was on par with application of RDF + half dose of borax + $MgSO_4$ + gypsum + neem cake (45.67 mites and 33.51%). The next best treatment was application of RDF + neem cake (47.17 mites and 31.32%) which was on par with remaining treatments except application of RDF + gypsum. Untreated control recorded significantly highest mite population. Similar trend was observed at 6 and 9 months after soil application of nutrients.

Average number of mites in different treatment indicated that the treatment which received RDF + full dose of borax + $MgSO_4$ + gypsum + neem cake was significantly superior by recording 38.62 mites with highest per cent reduction of mite (42.10%) which was on par with RDF + half dose of borax + $MgSO_4$ + gypsum + neem cake (42.67 mites and 36.03%). The next best treatment was RDF + borax (43.95 mites and 34.11%) which was on par with remaining treatments except untreated control.

The data presented in table 2 on per cent damaged nuts and damage grading indicated that in most of the treatments the percentage damaged nuts increased from 5th bunch to 8th bunch as the age of the nuts advanced. Soil application of RDF + full dose of borax + $MgSO_4$ + gypsum + neem cake was significantly superior treatment by recording lowest percentage damaged nuts (19.29%). The next best treatment was RDF + $MgSO_4$ (26.50%) and was on par with RDF + half dose of borax + $MgSO_4$ + gypsum + neem cake (29.66%) and RDF + gypsum (34.06%), whereas untreated control recorded highest per cent damaged nuts (93.21%). The treatment receiving RDF + full dose

Table 1. Effect of soil application of nutrients on coconut perianth mite, *Aceria guerreronis*

Treatments	Dosage (kg or g/palm /year in 2 splits)	Number of mites per 28.28 mm^2 area: 1 DBT	3 MASA	% reduction over UTC*	6 MASA	% reduction over UTC	9 MASA	% reduction over UTC	Average number of mites	% reduction over UTC
1.RDF	1.3 + 2.0 + 3.5 (urea+SSP+MOP)	54.33^{a}	49.11^{bc}	28.47^{bc} (32.23)	48.39^{cd}	25.95^{cd} (30.60)	45.22^{b}	25.63^{b} (30.36)	46.19^{b}	30.75^{c} (33.56)
2.RDF + Borax	RDF + 50g	64.33^{a}	50.28^{bc}	26.72^{bc} (31.09)	43.55^{bc}	33.44^{bc} (35.30)	41.06^{ab}	32.67^{ab} (34.78)	43.95^{b}	34.11^{b} (35.49)
3.RDF + $MgSO_4$	RDF + 500 g	60.17^{a}	48.67^{bc}	29.00^{bc} (32.51)	44.33^{bc}	32.26^{bc} (34.5)	42.94^{ab}	29.38^{ab} (32.73)	45.52^{b}	31.77^{bc} (34.17)
4.RDF + Gypsum ^{b}	RDF + 1kg	57.67^{a}	52.83^{c}	22.95^{c} (28.56)	36.56^{a}	44.01^{a} (34.02)	41.83^{a}	31.32^{ab} (41.53)	46.02^{b}	31.02^{bc} (33.68)
5.RDF + Neem cake	RDF + 5kg	54.83^{a}	47.17^{b}	31.12^{b} (33.73)	51.61^{d}	20.97^{d} (27.16)	38.44^{a}	37.01^{a} (37.42)	44.45^{b}	33.36^{bc} (35.06)
6.RDF + VC	RDF + 20 kg	64.50^{a}	48.94^{bc}	28.71^{bc} (32.35)	42.61^{abc}	34.74^{bc} (36.03)	38.28^{a}	37.12^{a} (37.49)	46.47^{b}	32.48^{bc} (34.63)
7.RDF + Neem granules	RDF + 2kg	53.67^{a}	50.55^{bc}	26.34^{bc} (30.87)	45.17^{bc}	30.92^{bc} (33.71)	42.16^{ab}	30.75^{ab} (33.66)	44.95^{b}	32.61^{bc} (34.69)
8.RDF + Neem oil + VC	RDF + 250 ml + 2 kg	61.33^{a}	49.33^{bc}	28.11^{bc} (32.00)	45.11^{bc}	30.87^{bc} (33.68)	45.11^{b}	25.89^{b} (30.56)	45.82^{b}	31.31^{bc} (33.87)
9.RDF + full dose of Borax + $MgSO_4$ + Gypsum + Neem cake	RDF + 50g + 500 g +1 kg + 5 kg	58.67^{a}	42.17^{a}	38.57^{a} (38.37)	38.89^{ab}	40.35^{ab} (39.36)	39.95^{ab}	34.26^{ab} (35.75)	38.62^{a}	42.10^{a} (40.28)
10.RDF + half dose of Borax + $MgSO_4$ + Gypsum + Neem cake	RDF + 25g + 250 g+ 0.5 kg + 2.5 kg	59.17^{a}	45.67^{ab}	33.51^{ab} (35.34)	42.50^{bc}	34.93^{bc} (36.19)	37.50^{a}	38.28^{a} (38.19)	42.67^{ab}	36.03^{b} (36.90)
11.Untreated check	-	62.33^{a}	68.63^{d}	-	65.38^{e}	-	60.89	^{c}	66.71c	-
CV%		9.65	5.03	7.97	7.20	9.45	6.52	8.99	5.31	5.30
SEm±		3.340	1.462	1.369	1.866	1.727	1.621	1.627	1.421	0.891
CD @ 5%		NS	4.314	4.038	5.505	5.094	4.781	4.801	1.421	2.894

RDF= Recommended dose of fertilizer, *= worked out from 3rd to 9th MASA, DBT= Day before treatment, MASA= months after soil application, UTC= Untreated control, VC= Vermicompost, SSP= Single super phosphate, MOP= Muriate of potash

Values in the parentheses are arc sin values for statistical analysis, Mean followed by same alphabet do not differ significantly by DMRT (p=0.05)

of borax + $MgSO_4$ + gypsum + neem cake was significantly superior and recorded least damage grading of nuts of 1.10. The treatments with RDF + $MgSO_4$ (1.56), RDF + half dose of borax + $MgSO_4$ + gypsum + neem cake (1.67), RDF + gypsum (1.75) and RDF + borax (1.83) were the next best treatments. Whereas, untreated control was inferior in recording highest damage grading (3.58).

In the present findings superiority of the potassium and mixture of nutrients might be due to the fact that potassium imparts resistance to the palm against insect and non-insect pest (Mandal, 1991; Moore *et al*., 1991) and acts as an activator of numerous enzymes, enhances the metabolic processes to reduce the mite incidence (Kamala Thirumalaiswamy *et al*., 2000).

Among the micronutrients boron is quite essential for higher plants (Huhenning and Brown, 1997). It activates certain dehydrogenase enzymes, facilitates sugar translocation and synthesis of nucleic acid and plant hormones which are essential for cell division and development in meristematic tissues, flowering and fruit/ seed set, translocation of sugar (Tisdale *et al*., 1995). Boron deficiency causes cracking of nuts (Tisdale *et al*., 1995). Cracking is associated with mite feeding on coconut nut meristem. Boron deficiency produces more quinons, which lead to cell damage, cessation of growth and browning of tissue (Kanniayan et al., 2002). Gypsum contains Ca and S. Calcium ions are used in the synthesis of new cell walls and also used in the mitotic spindle during cell division (Hepler and Wayne, 1985). Sulphur possesses acaricidal property, which probably helped in reducing the mite population whereas magnesium has a specific role in the synthesis of DNA and RNA. Osakabe (1967) obtained negative correlation between reproduction of *Tetranychus kanzawai* Nasar and Ghai in tea and magnesium level.

Neem cake contains 2 per cent of terpenoids mainly azadirachtin which is responsible for the antifeedant, antiovipositional, growth disruption, fecundity and fitness reducing properties on insects. Pest suppressing activity of neem cake may be attributed primarily to certain phenolic compounds released during decomposition (Alam *et al*., 1979) apart from stimulatory effect on root growth which helped profuse growth of roots and absorbed nutrients easily.

Table 2. Effect of soil application of nutrients on nut damage by *Aceria guerreronis* and damage grading

Sl. No.	Treatments	Dosage (kg or g/palm/ year in 2 splits)	Percentage of damaged nuts in					
			Bunch 5	Bunch 6	Bunch 7	Bunch 8	Average	Average grading
1.	RDF	1.3 + 2.0 + 3.5 (RDF)	59.33 c (50.37)	45.67 bcd (42.49)	59.32 ef (50.39)	60.38e (50.98)	56.18d (48.53)	2.44f
2.	NPK + Borax	RDF + 50 g	40.75 b (39.65)	25.05 ab (29.98)	35.61bcd (36.01)	44.78bcd (41.95)	36.44 c (37.11)	1.83bcd
3.	NPK + $MgSO_4$	RDF + 500 g	32..14 b (34.49)	14.19 a (18.29)	19.54 a (26.06)	40.15bc (39.25)	26.50 b (30.86)	1.56b
4.	NPK + Gypsum	RDF + 1 kg	37.01 b (37.45)	28.77 bc (32.04)	37.65 cd (37.83)	32.82ab (34.68)	34.06 bc (35.66)	1.75bc
5.	NPK + Neem cake	RDF + 5 kg	59.69 c (50.63)	38.05 bcd (38.07)	46.19 de (42.79)	53.15de (46.80)	50.94 d (45.52)	2.04cde
6.	NPK + VC	RDF + 20 kg	37.30 b (37.60)	54.47 d (47.55)	59.22 ef (50.46)	46.49cd (42.96)	49.37 d (44.62)	2.27ef
7.	NPK + neem granules	RDF + 2 kg	35.43 b (36.43)	50.76 cd (45.42)	59.28 ef (50.35)	42.70bcd (40.77)	47.04 d (43.28)	2.13def
8.	NPK + neem oil + VC	RDF + 250 ml + 2 kg	44.03 bc (41.54)	59.52 d (50.47)	62.09 e (52.14)	39.59bc (38.97)	51.31 d (45.73)	2.06cde
9.	NPK + full dose of Borax + MgSO4+ Gypsum + Neem cake	RDF + 50 g + 500 g +1 kg + 5 kg	0.96 a (15.58)	13.97 a (17.90)	27.79 abc (31.71)	24.45a (29.59)	19.29 a (25.71)	1.10a
10.	NPK + half dose of Borax + MgSO4 + Gypsum + Neem cake	RDF + 25 g + 250 g + 0.5 kg + 2.5 kg	31.67 b (34.22)	23.61 ab (29.00)	22.98 ab (28.57)	40.37bc (39.42)	29.66 b (32.98)	1.67b
11.	Untreated control	-	87.47 d (69.26)	92.67 e (74.44)	92.33 g (74.41)	100f (89.96)	93.14 e (74.89)	3.58g
	CV (%)	-	12.68	19.20	10.81	8.49	6.95	9.64
	SEm±		2.97	4.29	2.72	2.20	1.69	0.11
	CD at 5%		8.78	12.66	8.04	6.51	4.99	0.33

RDF= Recommended dose of fertilizer, VC= Vermicompst, Values in the parentheses are Arc sin values for statistical analysis,
Mean followed by same alphabet do not differ significantly by DMRT (p=0.05).

The present results throw light on the induced resistance through variation in chemistry of the plant as influenced by source of plant nutrition provided by different soil amendments and this is corroborated by Surekha and Arjuna Rao (2001), who reported that the induced resistance to pest is due to the higher polyphenols content in organic manure treated plants.

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