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Integrated management of coconut eriophyid mite *Aceria guerreronis* (Keifer) (Acarina: Eriophyidae)

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Abstract

The experiment on the 'Integrated management of coconut eriophyid mite *Aceria guerreronis* (Keifer) (Acarina: Eriophyidae)' was conducted during 2014-2016 at the farm of Asond block, Central Experimental Station, Wakawali, Dr. B. S. K. K. V., Dapoli. During August 2014, November 2014 and February 2015 the treatment, spraying with azadirachtin 1 per cent @ 4 ml/litre of water + recommended dose of fertilizers (T₂) was significant and showed lowest 40.00, 30.22 20.33 per cent eriophyid mite infestation respectively. During May 2015, the treatment T₆ was found significant and showed 22.85 per cent infestation. During August 2015, the treatment T₁ was found significant by recording 11.74 per cent infestation followed by T₆. During November 2015, T₆ was found significant and recorded 9.02 per cent infestation. During February 2016 T₂ showed significant reduction in mite infestation up to 7.73 per cent. The pooled mean of period 2014-2016 revealed that, during May the treatment T₆ was found to be significant by showing 38.88 per cent infestation. During August, the treatment T₁ was significant by showing 27.71 per cent infestation. During November, T₆ was found significant and showed 20.21 per cent eriophyid mite infestation. In February, T₂ was found significant which recorded 14.03 per cent eriophyid mite infestation followed by T₆, T₁ and application of recommended dose of fertilizers and azadirachtin through briquettes (T₅). During February 2016, same results were obtained, the treatment T₂ was significant by showing 7.73 per cent infestation. Overall results of field trial indicated that treatment T₆ was best treatment followed by T₂, T₁, T₃, T₈, T₅, T₇ and T₄. The per cent grade wise infestation was also observed minimum or found to be almost gradually reduced in same treatments during both years.

Keywords: Eriophyid mite, *aceria guerreronis*, integrated management, azadirachtin

1. Introduction

Coconut palm, *Cocos nucifera* L. called as 'Kalpavriksha' and it is grown in more than 93 countries worldwide. World production of coconut is 12.29 MT. India ranks number one with productivity of 10122 nuts per ha and area of about 2140.50 thousand ha with a production of 21665.19 MT. Total area under coconut in Maharashtra is about 28000 ha with a production of 187.47 million tons and productivity is 6676 nuts/ha. (Anon., 2014-15) [1]. Coconut is prone to various pest attacks viz. rhinoceros beetle, red palm weevil, black headed caterpillar, eriophyid mite and rats etc. Among which eriophyid mite is becoming a serious problem now a days. First time it was observed by Keifer at Mexico from Guerrero state in 1965. After its spread observed in number of countries. In India it was first reported in Ernakulam district of Kerala in 1998 at Ambalour panchayat (Sathiamma *et al.*, 1998) [14] and in Maharashtra from Vasai tahasil of Thane district in 2002. Coconut Eriophyid mites are worm-like, fusiform, microscopic, whitish to pale yellowish in colour. Adult measures about 200 to 250 μ in length and 36.52 μ in width (Ramarethianam and Loganathan, 2001) [13]. They cannot be seen by naked eyes. They spread through wind and mechanically transfer of the infested nuts from one place to other. The total life cycle is completed in 10 to 20 days (Marius, 1977) [8]. Female mite lays up to 200 eggs. Mite breeds under the perianth and suck the sap from the meristematic tissues of the nut surface. Damaged cells eventually become suberized and hence appear brown with hard compact surface. Stunt the nut growth and get dry/die, sometimes split gummy exudation. Mite population is peak on 3 to 6 month old nuts. Damage found to cause a loss of up to 30 per cent while it may increase up to 75 to 80 per cent loss in yield.

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In future it could be a very dangerous pest if not managed well at present and can cause tremendous loss in nut yield. Therefore, for effective management, considering farmer's operational conveniences and environmental safety this research was conducted.

Material and Methods

The statistically designed field experiment was conducted at Asond block, Central Experimental Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli located between 17° 14' to 17° 45' North latitude and longitude 73° 16' to 73° 19' East with an altitude of 167 to 234 m above mean sea level on the west coast. The average humidity was near about 77.85 per cent and temperature ranges from 18.41 °C to 23.00 °C in randomized block design with ten treatments during 2014-15 and 2015-16. Each treatment was replicated three times. Sixty coconut palms of variety *Pratap* were selected for the experiment purpose. The details of the material used and methods followed during the course of investigation are given below.

Experimental Details

1. Location : Asond block, coconut orchard of the Central Experimental Station, Wakawali of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli.
2. Crop : Coconut
3. Variety : *Pratap*
4. Year of planting : June, 1991
5. Design : Randomised Block Design (RBD)
6. Spacing : 8 m x 8 m
7. No. of palm per treatment : Two
8. Replications : Three
9. No. of treatments : 10

The treatment details are given below;

Treatment details

T1 Root feeding with azadirachtin (Neem azal) 5% @ 7.5 ml + 7.5 ml water and Recommended Dose of Fertilizers (RDF)

T2 Spraying with azadirachtin (Neem azal) 1% @ 4 ml/liter of water + RDF

T3 Drenching with eriophyid smash 250 ml/20 liters of water + RDF

T4 Application of RDF through briquettes

T5 Application of RDF and Azadirachtin (Neem azal) through briquettes

T6 Application of RDF, Azadirachtin (Neem azal) and Micronutrients through briquettes

T7 Application of RDF and Neem oil through briquettes

T8 Application of RDF through briquettes + Neem cake 15 kg /palm/ year

T9 Recommended Dose of Fertilizers

T10 Absolute control (No any fertilizer and other)

Method and timing of application

For treatment T₁ to T₃ and T₉, recommended dose of RDF (1:0.5:1 Kg NPK/palm/year) *i. e.* 2.17 kg Urea, 3.13 kg SSP and 1.67 kg MOP/palm/year respectively was given in three splits *viz.*, June, October and February in the palm basin.

a) Preparation of Briquettes:- Briquettes were prepared at Central Experimental Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli by using

briquettes preparing electrical machine. For treatments (T₄ to T₈), required quantity (RDF) was fulfilled by complex fertilizer *i.e.* Godavari (14:35:14), Urea and Muriate of potash for the preparation of briquettes. In treatment T₄, RDF dose was prepared with complex fertilizers in briquette form. In treatment (T₅) with Azadirachtin, the required quantity of Neem azal 5 per cent was added while preparing briquettes. Whereas, for treatment T₆ calculated quantity of micronutrients like Borax, Magnesium sulphate and Molybdenum were mixed along with neem azal 5 per cent in the constituents of the briquette. Also for treatment T₇ briquettes were prepared with addition of neem oil (180ml) instead of neem azal. In treatment T₈, neem cake (15 kg/palm/year) in pellets form was applied in palm basin for three times in a year with recommended dose of fertilizers through briquettes.

b) Application of briquettes:- The briquettes were applied in the palm basin thrice a year *i.e.* June, October and February (1.5 kg for each application) and covered with the soil. Irrigation was given during summer and winter season through drip as well as flood irrigation as per the requirement.

c) Root Feeding:- Root feeding of Neem azal 5 per cent *i.e.* 7.5 ml Neem azal (50000 ppm commercial product) plus 7.5 ml water was given thrice a year *viz.*, November, February and May. The live and active roots were traced by digging the pit near coconut trunk in a basin at a distance of one metre from tree trunk. The root selected was semi-hard, pencil thick and reddish brown coloured. The precaution was taken that the selected root should not get injury or any sort of damage. Such root was given slanting cut (45 degree) with the help of sharp knife. The cut was given in one stroke so that it should not blurt. The mixed solution of Azadirachtin 5 per cent @ 7.5 ml + 7.5 ml water was taken in polythene bag of 15 x 10 cm size. Then the slanting cut end of the root was dipped in the solution in such a way that it will have access the whole quantity of solution to be absorbed. Then the bag was tied to root with help of cotton thread. The root was covered with dry grass and soil. It was allowed for absorption by root and observed for 24 hrs. After 24 hrs if the solution was not absorbed by the root then the root was replaced by another root and the process was repeated till the solution was successfully absorbed by the root.

d) Drenching of eriophyid smash:- The eriophyid smash was drenched in palm basin thrice a year *i.e.* November, February and May. Eriophyid smash of quantity 250 ml was dissolved in 20 liters of water, stirred well by using thick wooden stick and poured in to a palm basin uniformly around the tree trunk along with the recommended dose of fertilizer. Eriophyid smash is a product developed by a company Genesis Venture Pvt. Ltd., at Karad and recommended by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, which contains C₃₅H₄₄O₁₆ *i.e.* Azadirachtin (0.03%), micronutrients like FeSO₄ (2.00%), MnSO₄ (1.00%), ZnSO₄ (5.00%), CuSO₄ (0.50%), H₃BO₄ (1.00%) and distilled water (90%) w/v.

e) Spraying - The spraying of Neem azal 1 per cent was done in November, February and May. The spraying solution was prepared by adding 4 ml Neem azal (10000 ppm commercial product) / liter of water. Spraying was done by trained person with the help of hand sprayer. The spraying was done on all bunches (except the unfertilized flower spathe) by calculating the volume of solution required for each treatment

Observations recorded

- a. Total number of nuts
- b. Infested nuts

- c. Per cent infested nuts
d. Gradewise nut infestation

The observations were recorded at three months interval on third bunch. The per cent infestation was worked out by following formula;

$$\% \text{ infested nuts} = \frac{\text{Infested nuts}}{\text{Total no. of nuts}} \times 100$$

Data thus obtained was converted in arc sine transformation and analyzed statistically.

Results and Discussion

The per cent eriophyid mite infestation during August 2014 revealed that, the treatment spraying with azadirachtin (Neem azal) 1 per cent @ 4 ml/liter of water + recommended dose of fertilizers (T₂) was significant showing 40.02 per cent eriophyid mite infestation and was at par with root feeding with azadirachtin (Neem azal) 5 per cent @ 7.5 ml + 7.5 ml water and recommended dose of fertilizers (T₁), recommended dose of fertilizers (RDF), azadirachtin (Neem azal) and micronutrients through briquettes (T₆), drenching with eriophyid smash 250 ml/20 liter of water + recommended dose of fertilizers (T₃), application of recommended dose of fertilizers and azadirachtin (Neem azal) through briquettes (T₅), application of recommended dose of fertilizers through briquettes (T₄), application of recommended dose of fertilizers through briquettes + Neem cake 15 kg /palm/ year (T₈) and application of recommended dose of fertilizers and Neem oil through briquettes (T₇) which showed 43.68, 43.92, 44.16, 47.06, 47.46, 48.44 and 49.42 per cent eriophyid mite infestation, respectively.

The per cent eriophyid mite infestation in November 2014 revealed that the treatment spraying with azadirachtin T₂ was significantly superior over rest of the treatments by showing 30.22 per cent eriophyid mite infestation and was at par with T₆, T₁, T₈, T₅, T₈, T₇, T₃ and T₄ which showed 31.40, 37.66, 43.76, 44.63, 46.24, 47.73 and 55.00 per cent eriophyid mite infestation, respectively.

During February 2015, data on per cent eriophyid mite infestation observed that, the treatment T₂ was significantly superior by recording 20.33 per cent eriophyid mite infestation except the treatments T₆, T₁, T₅, T₃, T₈, T₄ and T₇ which recorded 20.81, 22.01, 26.22, 26.93, 27.26, 34.64 and 34.65 per cent eriophyid mite infestation, respectively and all the treatments were at par with the treatment T₂.

During May 2015 revealed that, the treatment T₆ was found significantly superior over rest of the treatments and showed 22.85 per cent eriophyid mite infestation and was at par with T₂, T₁, T₇, T₅, T₃, T₈ and T₄ which showed 23.94, 25.19, 33.23, 33.40, 33.54, 37.73, 43.78 per cent eriophyid mite infestation, respectively.

During August 2015, data on per cent eriophyid mite infestation observed that, the treatment root feeding with T₁ was found significantly superior by recording 11.74 per cent eriophyid mite infestation and was at par with T₆, T₃, T₅, T₂, T₈ and T₇ and showed 12.84, 12.90, 14.64, 15.48, 15.94 and 16.32 per cent eriophyid mite infestation, respectively.

The mean per cent eriophyid mite infestation in the month of November 2015 revealed that, the treatment T₆ was found significantly superior and recorded 9.02 per cent infestation due to mites and was at par with T₂, T₁, T₈ and T₇ which showed 12.57, 14.02, 17.43 and 17.90 per cent eriophyid mite infestation, respectively.

During February 2016, the data on per cent eriophyid mite infestation observed that, the treatment T₂ showed significant reduction in mite infestation up to 7.73 per cent which was at par with the treatment T₆, T₁, T₅, T₃, T₈, T₇ and T₄ showed 8.74, 9.26, 10.68, 11.54, 12.43, 16.43 and 20.18 per cent eriophyid mite infestation, respectively.

The results of pooled mean of years 2014 - 2016 May revealed that, recommended dose of fertilizers (RDF), azadirachtin (Neem azal) and micronutrients through briquettes (T₆) was found significantly superior over rest of the treatments by showing 38.88 per cent eriophyid mite infestation and was at par with T₁, T₂, T₄, T₃, T₈, T₇ and T₅ which showed 45.77, 48.79, 50.03, 52.06, 50.58, 54.42 and 51.56 per cent eriophyid mite infestation, respectively.

The results of pooled mean on per cent eriophyid mite infestation of August revealed that, the treatment root feeding with azadirachtin (Neem azal) 5 per cent @ 7.5 ml + 7.5 ml water and recommended dose of fertilizers (T₁) was significant by showing 27.71 per cent eriophyid mite infestation and was at par with T₂, T₆, T₃, T₅, T₈, T₇ and T₄ which showed 27.75, 28.38, 28.53, 30.85, 32.19, 32.87 and 37.73 per cent eriophyid mite infestation, respectively.

The data on pooled mean of per cent eriophyid mite infestation of November indicated that, the treatment recommended dose of fertilizers (RDF), azadirachtin (Neem azal) and micronutrients through briquettes (T₆) was found significantly superior showing 20.21 per cent eriophyid mite infestation and it was at par with T₂, T₁, T₅, T₈, T₇, T₅ and T₃ which showed 20.21, 21.40, 25.84, 30.60, 32.07, 32.44 and 35.01 per cent eriophyid mite infestation, respectively.

While the pooled mean results of eriophyid mite infestation in February revealed that, the treatment spraying with azadirachtin (Neem azal) 1 per cent @ 4 ml/liter of water + recommended dose of fertilizers (T₂) was found significantly superior which recorded 14.03 per cent eriophyid mite infestation and was at par with T₆, T₁, T₅, T₃, T₈, T₇ and T₄ which recorded 14.78, 15.63, 18.45, 19.24, 19.84, 25.54 and 27.41 per cent eriophyid mite infestation, respectively.

The treatment recommended dose of fertilizers (RDF), azadirachtin (Neem azal) and micronutrients through briquettes (T₆) showed significant role during both the years as well as in pooled results also for per cent reduction of mite population, it may be due to the use of micronutrients and Azadirachtin (Neem azal). Among the micronutrients boron is quite essential for higher plants because boron deficiency causes cracking of nuts. Cracking is associated with mite feeding of coconut meristem. Boron deficiency produces more quinones, which lead to cell damage, cessation of growth and browning of tissues. Boron activates certain dehydrogenase enzymes, facilitate sugar translocation and synthesis of nucleic acid and plant hormones which are essential for cell division and development of meristematic tissues, flowering and fruit setting. Therefore plant got developed physiological resistance against the mite infestation.

The results of the present findings are in conformity with the results of the earlier workers. Palaniswamy *et al.* (2001) reported that the increased application of potassium @ 3.5 kg per palm recorded the least mite infestation probably due to increased plant resistance to the mite. Since, K and Neem cake are known to induce resistance to pests, they were recommended at 3.5 and 5 kg per palm, respectively. Further Ca, Mg, and B were known to induce some amount of resistance to mites. The application of farmyard manure @ 50 kg per palm was also recommended. Kannaiyan *et al.* (2002)

[2] reported that three sprayings of neem formulation *viz.*, Arishtau, nimicidine, neem azal TS, econeem and neemazin 4 ml/liter of water were effective for the management of coconut eriophyid mite. Vasantha Kumar (2003) [15] reported that, the application of 50 kg of FYM, 5 kg Neem cake, 1 kg Gypsum, 1.3 kg Urea, 2 kg SSP and 3.5 kg Potash is essential. Use of botanicals *viz.*, spraying with 1 per cent Azadirachtin @ 4 ml/ litre of water and rood feeding with 5 per cent Azadirachtin (7.5 ml + 7.5 ml of water) reduced the mite infestation. Hameed Khan (2003) [4] recommended use of Azadirachtin in different concentrations such as 0.003 per cent (Neem azal T/S @ 3 ml/l), Neem azal T/S containing 1 per cent Azadirachtin @ 4 ml/ litre of water, Azadirachtin 50000 ppm @ 0.004 per cent and FORS; Azadirachtin (5%) root feeding (7.5 ml + 7.5 ml of water). Mallik *et al.* (2005) [7] given the integrated approaches in management of coconut mite and revealed that, application of FYM/ Vermicompost 50 kg, Neem cake 5 kg, RDF NPK and 2 per cent neem oil, garlic and soap solution, Azadirachtin @ 4 ml/ litre of water, root feeding with neem azal and Econeem plus 10 ml/litre and mycohit (1%) thrice during April- May, October- November and December - January showed minimum infestation. Marimuthu (2003) [9] reported that among the ecofriendly agents, neem oil, neem oil + garlic extract + Azadirachtin 1 per cent were effective in reducing mite population. Among nutrient management urea 1.3 kg, SSP 2 kg and MOP 3.5 kg, gypsum 1 kg, Borax 50g, magnesium sulphate 0.5 kg and growing sun hemp twice in a year (seed rate 30 kg/ha) are recommended. Lokesh and Nandihalli (2009) [6] revealed that

among the different nutrients applied to soil recommended dose of fertilizer (RDF) + full dose of borax + MgSO₄ + gypsum + neem cake, RDF + half dose of borax + MgSO₄ + gypsum + neem cake and RDF + borax were the most effective and significantly superior treatments. Rafee and Nandihalli (2010) [12] revealed that, the use of macro, micronutrients and biorationals applied through soil, root feeding and foliar sprays has reduced coconut mite infestation. Bagde *et al.* (2014) [3] revealed that treatment which comprises spraying and root feeding of Neem azal 5 per cent found most effective followed by treatment Neem azal (1%) spray + Neem azal (5%) root feeding, Neem azal (5%) spray and Neem azal (1%) (Spray) + Neem azal (1%) root feeding in management of eriophyid mite population. Nasrin Akter *et al.* (2014) [10] reported that the coconut mite can be controlled by soil application of well decomposed Farm Yard Manure @ 50 kg and neem cake @ 5 kg/tree/year, recommended doses of Urea and Super phosphate and an increased dose of Muriate of Potash (Urea – 1.3 kg; Super Phosphate – 2.0 kg; Muriate of Potash – 3.5 kg/tree/year) and micronutrients (Borax - 50 g/tree/year; Gypsum - 1.0 kg/tree/year; Magnesium sulphate - 0.5 kg/tree/year). Also reported that, the application of spray of botanical pesticides three times like Azadirachtin 1 per cent @ 5 ml in one litre of water during January – February, Neem oil + Teepol @ 30 ml in one litre of water during March – April and Azadirachtin 1 per cent @ 5 ml in one litre of water during May – June and root feeding with Azadirachtin 1 per cent 10 ml +10 ml of water/ tree to reduce mite infestation.

Table 1: Effect of different treatments on infestation of eriophyid mite during year 2014-2015

S. No	Treatments	Per cent infestation				
		Feb. 2014	May. 2014	Aug. 2014	Nov. 2014	Feb. 2015
1	T ₁	66.35 (55.03)*	66.35 (55.03)	43.68 (41.33)	37.66 (37.62)	22.01 (26.45)
2	T ₂	60.43 (51.03)	73.63 (59.33)	40.02 (39.16)	30.22 (33.31)	20.33 (26.70)
3	T ₃	51.97 (46.15)	70.57 (58.13)	44.16 (41.62)	47.73 (43.70)	26.93 (29.91)
4	T ₄	60.75 (51.38)	56.28 (48.83)	47.46 (43.51)	55.00 (47.83)	34.64 (35.70)
5	T ₅	74.51 (60.09)	69.72 (56.62)	47.06 (43.31)	44.63 (41.87)	26.22 (30.79)
6	T ₆	56.79 (48.94)	54.92 (47.86)	43.92 (41.46)	31.40 (34.00)	20.81 (26.92)
7	T ₇	65.32 (54.12)	75.61 (60.49)	49.42 (44.67)	46.24 (42.83)	34.65 (35.96)
8	T ₈	60.61 (51.37)	63.44 (52.82)	48.44 (44.10)	43.76 (41.41)	27.26 (31.32)
9	T ₉	72.38 (58.49)	76.14 (60.98)	64.88 (53.67)	61.62 (51.91)	49.76 (44.81)
10	T ₁₀	75.35(60.38)	79.61 (63.22)	77.30 (61.59)	83.83 (69.29)	62.53 (52.43)
SE ±		4.08	4.38	3.05	6.08	4.88
CD at 5%		NS	NS	9.06	18.07	14.51

* Figures in parentheses are arc sine transformed values

Table 2: Per cent distribution of nuts in different grades of various treatments during year 2014-2015

S. No	Tr. No.	Per cent grade wise infestation																								
		Feb. 2014					May. 2014					Aug. 2014					Nov. 2014					Feb. 2015				
		0	I	II	III	IV	0	I	II	III	IV	0	I	II	III	IV	0	I	II	III	IV	0	I	II	III	IV
1	T ₁	33.65	28.08	30.55	5.56	2.16	33.65	29.64	31.20	3.31	2.20	56.32	19.06	15.37	7.14	2.11	62.34	21.91	12.20	2.20	1.36	77.99	11.60	9.61	0.34	0.46
2	T ₂	39.57	22.96	29.56	6.64	1.27	26.37	30.80	31.19	10.12	1.51	59.98	20.98	13.64	2.04	3.36	69.78	17.08	12.55	2.18	1.75	79.67	8.23	8.85	1.45	1.80
3	T ₃	48.03	15.42	26.00	8.96	1.60	29.43	30.49	27.66	6.39	6.04	55.84	23.88	14.94	3.30	2.03	52.27	19.58	15.52	10.04	2.59	73.07	10.46	12.99	2.64	0.84
4	T ₄	39.25	13.31	37.42	6.13	3.89	43.72	31.93	14.43	7.46	2.46	52.54	22.72	22.84	0.39	1.52	45.00	19.19	22.71	8.91	4.20	65.36	13.73	14.45	5.56	0.90
5	T ₅	25.49	23.53	39.76	7.99	3.23	30.28	27.99	32.94	6.65	2.14	52.94	25.25	16.85	3.46	1.50	55.37	19.36	16.89	4.03	4.36	73.78	9.96	9.02	5.88	1.36
6	T ₆	43.21	26.55	24.02	4.13	2.09	45.08	23.62	23.30	4.39	3.60	56.08	13.62	23.67	3.34	3.28	68.60	19.41	8.26	3.73	0.00	79.19	8.10	10.21	1.56	0.93
7	T ₇	34.68	27.50	30.18	6.51	1.12	24.39	31.59	33.28	6.20	4.53	50.58	20.91	21.41	3.92	3.18	53.76	28.12	13.92	1.84	2.37	65.35	19.99	11.53	2.25	0.89
8	T ₈	39.39	30.44	25.69	2.58	1.90	36.56	36.53	20.81	3.18	2.93	51.56	28.27	15.05	2.14	2.98	56.24	17.71	19.22	4.78	2.05	72.74	13.63	11.90	1.72	0.00
9	T ₉	27.62	38.15	23.65	8.42	2.16	23.86	38.69	27.11	3.52	6.82	35.12	37.58	21.75	1.05	4.50	38.38	23.32	24.37	10.43	3.50	50.24	19.16	18.97	7.29	4.34
10	T ₁₀	24.65	42.89	27.22	4.07	1.17	20.39	40.36	20.68	10.14	8.43	22.70	30.83	27.97	10.78	7.72	16.17	18.39	32.04	22.59	10.80	37.47	12.97	21.49	17.66	10.41

Table 3: Effect of different treatments on infestation of eriophyid mite during year 2015-2016

Sr. No.	Treatments	Per cent infestation			
		May. 2015	Aug. 2015	Nov. 2015	Feb. 2016
1	T ₁	25.19 (29.65)*	11.74 (19.83)	14.02 (21.67)	9.26 (17.14)
2	T ₂	23.94 (28.82)	15.48 (21.90)	12.57 (20.72)	7.73 (15.82)
3	T ₃	33.54 (34.99)	12.90 (21.04)	22.29 (28.11)	11.54 (19.69)
4	T ₄	43.78 (41.34)	28.00 (31.94)	31.40 (34.08)	20.18 (26.52)
5	T ₅	33.40 (35.27)	14.64 (22.17)	20.26 (26.21)	10.68 (19.07)
6	T ₆	22.85 (28.50)	12.84 (20.97)	9.02 (17.44)	8.74 (17.16)
7	T ₇	33.23 (34.20)	16.32 (23.79)	17.90 (24.91)	16.43 (23.68)
8	T ₈	37.73 (37.88)	15.94 (23.50)	17.43 (24.54)	12.43 (20.38)
9	T ₉	50.84 (45.48)	54.80 (47.78)	36.09 (36.80)	21.54 (27.54)
10	T ₁₀	68.42 (56.52)	62.02 (52.14)	55.97 (48.70)	40.34 (39.34)
	SE±	5.24	2.91	3.11	2.21
	CD at 5%	15.57	8.64	9.24	6.58

* Figures in parentheses are arc sine transformed values

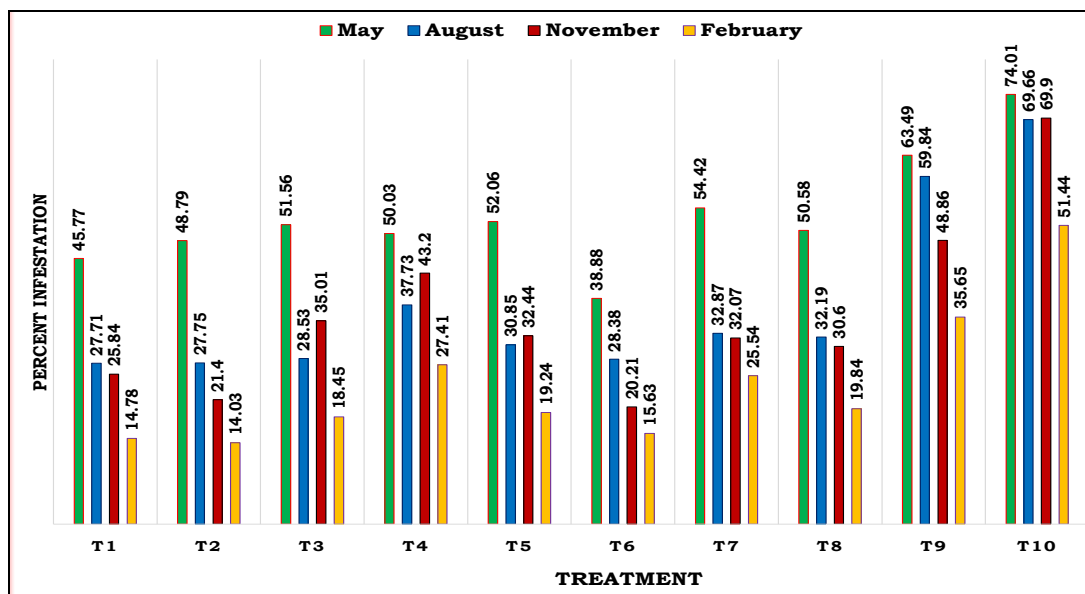
Table 4: Per cent distribution of nuts in different grades of various treatments during year 2015-2016

S. No.	Tr. No.	Per cent grade wise infestation																			
		May 2015					Aug. 2015					Nov. 2015					Feb. 2016				
		0	I	II	III	IV	0	I	II	III	IV	0	I	II	III	IV	0	I	II	III	IV
1	T ₁	74.81	15.42	8.10	0.83	0.83	88.26	7.02	3.69	0.71	0.33	89.73	4.03	5.44	0.81	0.00	90.74	5.92	2.29	0.66	0.39
2	T ₂	76.06	14.00	8.40	1.33	0.22	84.52	10.99	3.53	0.96	0.00	87.50	7.80	3.13	0.78	0.79	92.27	4.44	2.01	1.09	0.19
3	T ₃	66.46	13.81	15.88	3.85	0.00	87.10	5.75	3.41	3.47	0.27	79.75	9.09	10.49	0.67	0.00	88.46	7.25	3.03	0.63	0.63
4	T ₄	56.22	15.46	26.00	2.31	0.00	72.00	11.48	10.52	2.67	3.33	68.43	13.60	12.46	4.45	1.06	79.82	8.11	9.71	1.44	0.92
5	T ₅	66.60	19.25	10.64	2.94	0.57	85.36	7.33	5.40	1.22	0.69	73.24	17.26	8.66	0.84	0.00	89.32	6.68	4.00	0.00	0.00
6	T ₆	77.15	16.33	9.25	0.61	0.00	87.16	9.69	2.14	0.00	1.01	91.41	5.70	2.16	0.22	0.51	91.26	6.05	0.96	1.05	0.68
7	T ₇	66.77	17.57	14.55	1.11	0.00	83.68	9.24	4.27	1.93	0.89	85.13	11.30	3.57	0.00	0.00	83.57	7.37	8.11	0.95	0.00
8	T ₈	62.27	20.10	15.54	2.08	0.00	84.06	12.77	2.82	0.00	0.34	84.81	10.16	3.07	1.39	0.58	87.57	5.51	5.07	1.23	0.61
9	T ₉	49.16	32.35	18.12	0.37	0.00	45.20	22.18	20.81	5.94	5.88	62.86	16.28	15.20	4.33	1.33	78.46	11.64	6.21	3.03	0.67
10	T ₁₀	31.58	33.85	23.08	6.83	4.67	37.98	19.31	19.41	14.78	8.51	43.58	25.61	22.11	5.20	3.50	59.66	18.05	14.82	5.01	2.47

Table 5: Pooled mean of 2014 - 2016 showing effect of different treatments on infestation of eriophyid mite

Sr. No.	Treatments	Pooled mean of infestation			
		May	August	November	February
1	T ₁	45.77 (42.34)	27.71 (30.58)	25.84 (29.65)	14.78 (21.79)
2	T ₂	48.79 (44.08)	27.75 (30.53)	21.40 (27.01)	14.03 (21.26)
3	T ₃	51.56 (46.56)	28.53 (31.33)	35.01 (35.91)	18.45 (24.80)
4	T ₄	50.03 (45.09)	37.73 (37.72)	43.20 (40.96)	27.41 (31.11)
5	T ₅	52.06 (45.94)	30.85 (32.74)	32.44 (34.04)	19.24 (24.93)
6	T ₆	38.88 (38.18)	28.38 (31.21)	20.21 (25.72)	15.63 (22.04)
7	T ₇	54.42 (47.34)	32.87 (34.23)	32.07 (33.87)	25.54 (29.82)
8	T ₈	50.58 (45.35)	32.19 (33.80)	30.60 (32.97)	19.84 (25.85)
9	T ₉	63.49 (53.23)	59.84 (50.73)	48.86 (44.36)	35.65 (36.18)
10	T ₁₀	74.01 (59.87)	69.66 (56.86)	69.90 (58.99)	51.44 (45.88)
SE ±		4.81	2.98	4.59	3.54
CD at 5%		11.67	8.85	13.65	10.54

* Figures in parentheses are arc sine transformed values

**Fig 1:** Pooled mean of year 2014-2016 showing effect of different treatments for the control of coconut eriophyid mite infestation

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