



E-ISSN: 2320-7078

P-ISSN: 2349-6800

[www.entomoljournal.com](http://www.entomoljournal.com)

JEZS 2020; 8(5): 1967-1971

© 2020 JEZS

Received: 16-07-2020

Accepted: 09-09-2020

**SM Wankhede**

Junior Entomologist,

Regional Coconut Research

Station, Bhatye, Ratnagiri,

Maharashtra, India

**VV Shinde**

Agronomist, Regional Coconut

Research Station, Bhatye,

Ratnagiri, Maharashtra, India

**HP Maheswarappa**

Project Coordinator,

AICRP on Palms, ICAR-CPCRI

Kasaragod, Kerala, India

**SL Ghavale**

Research Officer, Regional

Coconut Research Station,

Bhatye, Maharashtra, India

**Corresponding Author:****SM Wankhede**

Junior Entomologist,

Regional Coconut Research

Station, Bhatye, Ratnagiri,

Maharashtra, India

## Impact of integrated management package on eriophyid mite, *Aceria guerreronis* (Keifer) and yield of Coconut

**SM Wankhede, VV Shinde, HP Maheswarappa and SL Ghavale**

### Abstract

The field experiment was conducted to validate the IPM and INM combination package for the management of coconut eriophyid mite at AICRP (Palms), Regional Coconut Research Station, Bhatye Dist. Ratnagiri (M.S.) during 2016-17 to 2019-20. The two treatments were evaluated with paired block design in a plot having 50 palms for each treatment. Integrated package included INM (Recommended NPK dose, FYM @ 20kg, Vermicompost @ 20kg, Neem cake @ 5kg, cowpea/sunhemp as green manure crop in basin, Coconut husk incorporation @ 10kg/palm, Micronutrient application @ 500g/palm, Keraprobio (100 g/palm) were applied in May-June) and IPM (consisting of, root feeding of Fenpyroximate 5 % @ 10 ml + 20 ml of water was given in March and palm oil sulphur 5g emulsion was sprayed in December). The other set of treatment was application of recommended NPK dose and FYM only (Control plot). The pre-treatment data indicated that the incidence of eriophyid mite was recorded 65.2 per cent in treated plot and 63.7 per cent in control plot. The mean data of 2017 to 2020 indicated that the mite infestation significantly decreased to 19.6 per cent in IPM and INM treatment. Whereas, it was increased to 71.2 per cent over pre-count observations in untreated control. Regarding eriophyid mite grade index and intensity, the grade index in INM & IPM plot significantly declined to mild with grade index of 0.3 and average mite population 3.96/16 mm<sup>2</sup> which were significantly superior over control plot which recorded higher index and population (1.68 and 15.91/16mm<sup>2</sup>, respectively). INM with IPM treated plot recorded maximum nut yield (116 nuts/palm) with the highest B:C ratio 2.67 as compared to control (83 nuts/palm).

**Keywords:** Coconut, eriophyid mite, IPM, INM, nut yield

### Introduction

The Coconut palm (*Cocos nucifera* Linn.) has great socio-economic significance as it is the source of livelihood for more than 20 million people globally, especially small and marginal farmers. It provides people basic needs such as food, drink, shelter, fuel, furniture, medicine, decorative materials and much more. Coconut attacked by many of the pests, and coconut eriophyid mite, *Aceria guerreronis* Keifer is the most harmful pest which are pale coloured, elongated, worm like mite, very minute in size measuring 200-250 micron length and 36-52 micron in width with two pairs of legs in the anterior end, head with piercing and sucking mouth parts. The mite infests and develops on the meristematic tissues under the perianth. Initial symptoms exhibit as triangular pale white or yellow patches close to the perianth. Continuous feeding results in necrosis of tissues leading to formation of brown color patches, longitudinal fissures and splits on the outer surface of the husk, oozing of brown gummy exudation, reduced nut size, copra content and malformation of nuts. There are 1,859 species of eriophyid mites, *Aceria guerreronis* Keifer was first reported as a serious pest in Kerala during 1997-98. Subsequently, the devastating effects of these mites were noticed in Coimbatore and Theni districts of Tamil Nadu and Bangalore in Karnataka [8, 11]. Most of the infested nuts were in the damage category of two and three [5]. Even though Lakshaganga recorded the lowest damage among hybrids, Kerasree was found to be better as the percentage of nuts damage by mite in the category of 4 and 5 was nil and the percentage of mite damage was only 25.4 per cent. The coconut eriophyid mite was reported to cause damage in coconut plantations in Konkan region of Maharashtra during January 2002 [3]. By considering above facts in view, there is lack of information on effect of integrated management involving nutrient and pest management aspects and hence the present investigation was carried out with a objective to study the impact of INM with IPM package on coconut eriophyid mite and growth and yield of coconut.

## Materials and Methods

The field experiment was conducted with 20 year old Pratap variety of coconut under irrigated condition at AICRP (Palms), Regional Coconut Research Station, Bhatye Dist. Ratnagiri (M.S.) during 2016-17 to 2019-20 to test the Integrated Pest Management (IPM) and Integrated Nutrient Management (INM) combination package for the management of coconut eriophyid mite. The two treatments were evaluated by adopting paired block design in a plot having 50 palms for each treatment. Integrated package included INM (recommended NPK dose, FYM (20kg), Vermicompost (20kg), Neem cake (5kg), Cowpea/sunhemp @ 50g/palm as green manure crop in basin and incorporation, Coconut husk incorporation @ 10 kg/palm, Micronutrient application @ 500g/palm, Keraprobio (100 g/palm) were applied in May-June) and IPM (consisting of, root feeding of Fenpyroximate 5 % @ 10 ml + 20 ml of water was given in March and palm oil sulphur @5g emulsion was sprayed in December). The other set of treatment was application of recommended NPK dose and FYM only (Control plot). INM with IPM packages were implemented during March, 2017 in the plot as per the experimental protocol. The intensity of eriophyid mite was recorded from the 3<sup>rd</sup> bunch of coconut and per cent infestation of nuts was calculated by counting infested nuts out of total nuts, mite population / 16 mm<sup>2</sup> and mite damage grade index (MDGI) were noticed. Mean damage grade index (MDGI) scale and formula for coconut eriophyid mite was worked out [2].

### Scale for Coconut Eriophyid Mite

Percent damage on nut surface	Scale	Grade	Intensity
Nuts with no mite damage	0	0	Nil
< 25%	1	0.1- 1.0	Mild
25 to 50 %	2	1.1-2.0	Moderate
50 to 75 %	3	2.1-3.0	High
>75 %	4	3.1-4.0	Severe

Fifty palms of each treatment were selected for recording annual leaf and inflorescence production during the year. Harvested nuts were counted at each harvest every year and average yield per palm was worked out. Copra and oil content

were analyzed during March of every year from five randomly selected nuts of each treatment. Data thus obtained was subjected to appropriate transformation and was analyzed statistically.

## Results and Discussions

### Effect on Eriophyid mite

The intensity of eriophyid mite was recorded from the 3<sup>rd</sup> bunch of coconut in the month of March, 2017 as a pre-count observation. The pre-treatment data indicated that there was no significant difference observed among the treatments about nut damage by eriophyid mite, mite population/16mm<sup>2</sup> and mean grade index of eriophyid mite. Post treatment observations were recorded at three monthly intervals initially later on six monthly which depicted in Fig. 1 to 3.

The observations in respect of nut damage by eriophyid mite revealed that, At August 2017, the mite infestation gradually decreased up to 46.9 percent in INM with IPM treated plot. Whereas, it was increased 81.1 percent in control plot. In November 2017, similar trends were noticed about nut damage and found INM with IPM treatment was significantly superior over control. In February 2018, the nut damage was observed 38.9 percent in INM with IPM block which was significantly superior over control (77.3%). At August 2018, the nut infestation significantly decreased up to 23.6 percent in INM with IPM treated plot. Whereas, it was increased 78.1 per cent over in control plot. At February 2019, the nut infestation significantly decreased up to 13.2 percent in INM with IPM treated plot which was significantly superior over in control plot (90%). In August 2019, minimum nut damage was noticed (11.3 %) in INM with IPM plot over control (60.7 %) was found significantly superior over control. Similar trends were noticed in respect of nut damage during February 2020. The overall data indicated that the nut damage by eriophyid mite was gradually reduced in INM with IPM plot from August, 2017 to February, 2020 due to additive effect of integrated approach treatments. Whereas, nuts damage by eriophyid mite was above fifty per cent during every year in control plot. Maximum peak was observed in November, 2017 followed by February 2019 in control plot because of congenial favorable climate and lack of eriophyid management treatments during the period (Fig.1).

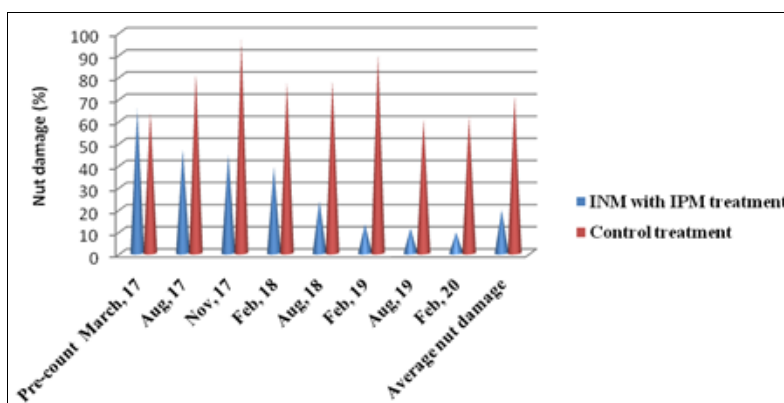


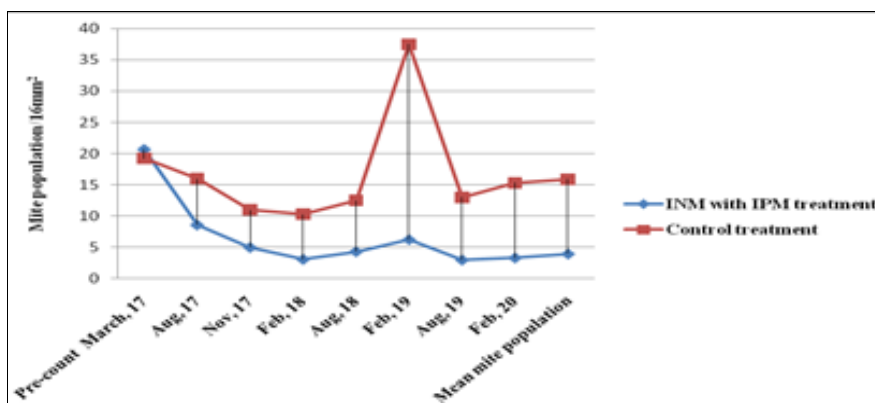
Fig 1: Effect of INM with IPM package on incidence of coconut eriophyid mite

With regard to eriophyid mite population, intensity (8.6/16 mm<sup>2</sup>) was noticed in INM with IPM plot at August, 2017 which was significantly superior over control. In November 2017, similar trend was noticed in respect of intensity of mite which recorded 5.0 /16mm<sup>2</sup>. At February 2018, minimum mite population was found in INM with IPM plot

(3.1/16mm<sup>2</sup>) over in control plot (10.316mm<sup>2</sup>). At August 2018 and February 2019, the lowest mite population was noticed 4.3/16 mm<sup>2</sup> and 6.25/16 mm<sup>2</sup> in INM with IPM treated plot, respectively over control (12.5 and 37.5/16 mm<sup>2</sup>, respectively). In August 2019, eriophyid mite intensity was noticed (3.0/16mm<sup>2</sup>) which was significantly superior over

control (13.0/16mm<sup>2</sup>). Similar trends were observed in February 2020. The overall observations indicated that the eriophyid mite population gradually declined under IPM components combined with INM components adopted plot during the period of August, 2017 to February 2020 except in

February 2019 which was mainly attributed to sudden increase temperature in atmosphere. Its population simultaneously increased from November, 2017 to February, 2020 and reached major peak (36 nos.) during February, 2019 (Fig. 2).

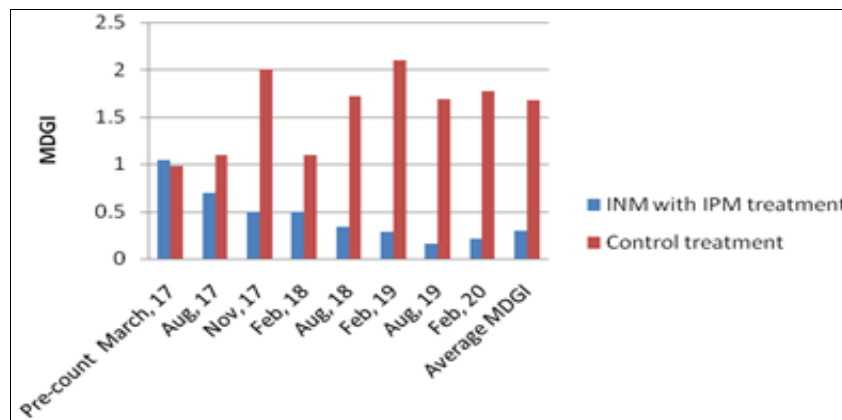


**Fig 2:** Effect of integrated management package on population of

**eriophyid mite**

Regarding mean grade index, gradually declined to mild of 0.7 at August 2017. Similarly, in November 2017 and February 2018, similar trend was noticed in respect of mite grade index which recorded 0.5 in INM with IPM block was significantly superior over control (2 and 1.1, respectively). At August 2018, the grade index in INM with IPM treated plot significantly declined grade index to 0.34. The grade index 0.28 was recorded 0.28 at February 2019 in INM with IPM treated plot. In August 2019, lowest index was noticed in

respect of grade 0.16 (mild) which was found significantly superior over control (1.69). Similar trends were noticed in February 2020. The overall data indicated that the mite damage grade index (MDGI) was gradually reduced from August 2017 to February 2020. It was not noticed above 1.0 during the experimental period in IPM components combined with INM components adopted plot. However, maximum peak was observed in February 2019 and found above 1.5 after August, 2018 in control plot (Fig.3).



**Fig 3:** Impact of INM with IPM treatment of eriophyid mite damage grade index (MDGI)

The mean data of mite incidence is presented in Table 1, which indicated that the INM with IPM treatment was found significantly superior over control plot in respect of nut damage by eriophyid mite (19.65%), mite population/16 mm<sup>2</sup> (3.96) and 0.3 mean grade index (MGI) owing to IPM components combined with INM components adopted treatment effect compared to control plot which recorded 71.28 per cent nut damage, 15.91 mite population/16mm<sup>2</sup> and 1.68 MGI.

The results of the present findings was collaborative with the

findings of nut damage by eriophyid mite was significantly reduced to 30.6 per cent and the mean grade index was significantly reduced to 0.36 also the mite population significantly reduced to 20.2 numbers/16mm<sup>2</sup> [1]. Yield loss resulted from severe nuts damage such as category 4 and 5, and most of the infested nuts were in the damage category of two and three [9]. General decline in the mite population corresponding with rainy season and winter months, coupled with corresponding expression of damage symptoms on the button [12].

**Table 1:** Impact of INM and IPM package against coconut eriophyid mite

S. No.	Treatments	Pre-treatment (March, 2017)			Post-treatment Mean (2017-2020)		
		Nut damage (%)	Mite Population/16 mm <sup>2</sup>	Mean Grade Index	Nut damage (%)	Mite Population /16 mm <sup>2</sup>	Mean Grade Index
T1	INM with IPM package	65.2 ± 2.9	20.6 ± 1.1	1.0 ± 0.0	19.65 ± 2.17	3.96 ± 0.58	0.30 ± 0.01
T2	Control treatment	63.7 ± 3.6	19.2 ± 1.3	0.9 ± 0.0	71.28 ± 3.36	15.91 ± 0.87	1.68 ± 0.07
‘t’ value		0.75	0.44	0.004	6.42	3.68	4.03
Sig. (P= 0.05)		N.S.	N.S.	N.S.	Sig.	Sig	Sig.

### Effect on growth and yield of coconut

The observations on growth and yield parameters are presented in Table 2. From the data it was observed that, there was no significant difference observed during pre-observation among the treatments. The post experimental mean observations indicated that, the maximum leaf production (11.7) was noticed in IPM components combined with INM components adopted plot which was significantly superior over control (10.2). Similarly, inflorescence production was also significantly superior in IPM components combined with INM components adopted plot (11.1) than control plot (9.4). Impact of integrated approaches was seen in increase in nuts yield (116 nos) which found significantly superior over control (83 nos). Copra content recorded maximum in IPM components combined with INM components adopted plot (157.5 g/nut) found significantly superior over control (130 g/nut). Increase of leaf production owing to integrated nutrient management in coconut helped to increase nut yield in coconut [10]. Application of nutrients could be more beneficial when applied 50 per cent of nutrient supply (on N basis) as CCP + 50 per cent though chemical fertilizers and

100 per cent composted coir pith in coconut gardens under coastal ecosystem of Andhra Pradesh [4]. Integrated treatments resulted in higher number of leaves (12 no.) and application of vermicompost in combination with inorganic fertilizer either at 25% of N + 75% NPK (64.5 nuts/palm/year) or 50% of N + 50% NPK (66.2 nuts/palm/year) resulted in significantly higher nut yield [7].

### Economics of the management treatments:

Economics of the treatments was worked out and average of three years is presented in the Table 3. The economic benefits indicated that, the highest net return (Rs.2,54,450/ha/year) was observed in INM with IPM treatment as compared to control plot (Rs.95,200/ha/year), whereas the B:C ration was higher with T1 (2.67) compared to control plot (2.20) (Table 3). The higher net return under INM and IPM was mainly due to increase in nut yield. Present findings are collaborative with the application of vermicompost in combination with inorganic fertilizer either at 25 % Vermicompost (VC) + 75 % NPK or 50 % VC + 50 % NPK resulted in significantly higher nut yield compared to inorganic fertilizer alone [6].

**Table 2:** Effect of integrated package on growth and yield of coconut

Treatments	Initial observations					Post treatments observations (2017-20)				
	Annual leaf production	Annual inflorescence production	Nut yield/palm (Nos)	Copra content (g/nut)	Oil content (%)	Annual leaf production	Annual inflorescence production	Nut yield/palm (Nos)	Copra content (g/nut)	Oil content (%)
INM with IPM package	9.3	9.0	106	136	62	11.7	11.1	116	157.5	66
Control treatment	8.8	8.0	82	134	61	10.2	9.4	83	130	63
‘t’ value	0.0	0.5	0.01	0.17	0.5	6.31	2.40	9.81	9.29	0.0
Sig. (P= 0.05)	N.S.	N.S.	N.S.	N.S.	N.S.	Sig.	Sig.	Sig.	Sig.	N.S.

**Table 3:** Impact of INM with IPM on Economics coconut production

Treatments	Cost of production (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
INM with IPM package	1,51,550/-	4,06,000/-	2,54,450/-	2.67
Control treatment	79,100/-	1,74,300/-	95,200/-	2.20

### Conclusion

The INM with IPM treatment found effective for the management of eriophyid mite with increased of nuts yield and health of the palm.

### Acknowledgement

The authors are thankful to ICAR-AICRP (Palms) for providing funds, technical help and timely guidance for conduct of experiment. Authors acknowledge the supply of Keraprobio from Dr. Alka Gupta, Principal Scientist, ICAR-CPCRI, Kasaragod.

### References

1. Alagar M, Srinivasan T, Maheswarappa HP. Integrated

- management of coconut eriophyid mite, *Aceria guerreronis* Keifer (Eriophyidae: Acari). 23<sup>rd</sup> Plantation Crops Symposium, 6-8 March, Book Abstracts. 2019; ABSP6:105.
- Bagde AS, Patil PD, Pashte VV. Efficacy of different modules against eriophyid mite management. Environment and Ecology. 2015; 33(4):1500-1503.
- Desai VS, Desai SD, Mayekar AJ, More VG. Infestation of coconut eriophyid mite, *Aceria guerreronis* Keifer in Konkan region of Maharashtra. The Journal of Plant Protection Sciences. 2009; 1(1):76-79.
- Kalpana M, Gautam B, Rao DVR, Arulraj S, Jayabose C. Impact of integrated nutrient management on nut yield and quality of coconut under coastal ecosystem. Journal

- of Plantation Crops. 2008; 36(3):249-253.
5. Levin Lily, Mammooty KP. Incidence of coconut eriophyid mite *Aceria guerreronis* Keifer (eriophyidae: acari) in different coconut cultivars and hybrids. Journal of Tropical Agriculture. 2003; 41:59-62.
  6. Maheswarappa HP, Thomas GV, Ravi Bhat, Palaniswami C, Jayasekhar S. Impact of inorganic fertilizer substitutions by vermicomposted coconut leaves on productivity and economics of coconut. Journal of Plantation Crops. 2011; 39(1):30-34.
  7. Maheswarappa HP, Thomas GV, Alka Gupta, Ravi Bhat, Palaniswami C. Productivity and nutrient status of coconut (*Cocos nucifera*) as influenced by integrated nutrient management with vermicomposted coconut leaves. Indian Journal of Agronomy. 2014; 59(3):455-459.
  8. Mohanasundaram M, Kalyanasundaram SK, Somasundaram OVR, Mahaendran R. Management and control measure for the coconut eriophyid mite, *Aceria guerreronis* Keifer (Eriophyidae: Acari) in Tamil Nadu. Indian Cocon. J. 1999; 29(9):8-10.
  9. Moore D, Alexander L, Hall RA. The coconut mite, *Eriophyes guerreronis* Keifer in St. Lucia: Yield losses and attempts to control it with acaricide, polybutene and Hirsutella fungus. Trop. Pest. Mgmt. 1989; 35(1):83-89.
  10. Nath JC, Arulraj S, Maheswarappa HP. Integrated nutrient management of COD × WCT hybrid coconut under alluvial clay-loam soil of Assam. Journal of Plantation Crops. 2012; 40(2):105-10.
  11. Sathiamma B, Nair CPR, Koshy PK. Outbreak of a nut infesting eriophyid mite, *Eriophyes guerreronis* (K.) in coconut plantations in India. Indian Coconut Journal. 1998; 29:1-3.
  12. Vidya CV, Ranjith AM. Seasonal population of coconut eriophyid mite (*Aceria guerreronis* Keifer). Pest Management in Horticulturral Ecosystem. 2004; 10(1):67-71.