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ECO-FRIENDLY MANAGEMENT OF COCONUT ERIOPHYID MITE *ACERIA GUERRERONIS* (KEIFER) (ACARINA: ERIOPHYIDAE) WITH BIO-PESTICIDES UNDER LABORATORY CONDITIONS

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ABSTRACT
The study on 'Eco-friendly Management of Coconut Eriophyid Mite *Aceria guerreronis* (Keifer) (Acarina: Eriophyidae) with bio-pesticides under Laboratory Conditions' was conducted at biocontrol laboratory, Department of Agril. Entomology, Dr. B. S. K. K.V., Dapoli. The treatments like *Beauveria bassiana*, *Hirsutella thompsoni, Verticillium lecanii, Metarrhizium anisopliae, Paecilomyce fairnescence* , Neem oil, Neem azal 5 per cent, Neem azal 1 percent and only water spray were applied on the mite colony under the nut perianth and results revealed that, on third day after treatment the maximum mite mortality (22.00) was recorded in T_1 (application of *H. thompsoni* @ 5 g/ lit.) which was at par with treatment T_2 (application of *Beauveria bassiana* @ 5 g/ lit.) and T_6 (application of Neem oil 20 ml/lit.) showing 8.75 and 8.50 mite mortality, respectively. Five days and eight days after application the treatment T_1 recorded maximum mite mortality 32.25 and 38.75 per cent, respectively. The overall results concluded that the application of *H. thompsoni* @ 5 g/ lit., application of *V. lecanii* @ 5 g/ lit., application of Neem oil 20 ml/lit. and application of *B. bassiana* @ 5 g/ lit. can be used for the management of coconut eriophyid mite.

INTRODUCTION

Coconut palm, *Cocos nucifera* L. known as 'Kalpavriksha'. It is grown in more than 93 countries. World production of coconut is 12.29 MT. India ranks number one among the coconut growing countries with productivity of 10122 nuts per ha and area of about 2140.50 thousand ha with a production of 21665.19 million tons. 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). Coconut is prone to various pest like rhinoceros beetle, red palm weevil, black headed caterpillar, eriophyid mite and rats. Among all the pests eriophyid mite is becoming a serious problem now a days. First time it was observed by Keifer at Mexico from Guerrero state in 1965. In India it was first reported in Ernakulam district of Kerala in 1998 (Sathiamma *et al.*, 1998) and in Maharashtra from Vasai tahsil of Thane district in 2009 (Desai *et al.*). Coconut Eriophyid mites are worm-like, fusiform, microscopic, whitish to pale yellowish in colour. The adult measures 200 to 250 μ in length and 36.52 μ wide. The female adult mite lays 50 to 100 eggs during its lifetime. The eggs hatch in two days. The life cycle consists of egg, two nymphal instars and an adult stage. The total life cycle is completed in 10 to 20 days (Marau, 1977). Initially the damage appear as a triangular yellowish brown patch at perianth surface and as infestation advances a number of similar patches can be seen on nut which ultimately leads to warting and longitudinal fissures on the nut (Ramarethianam and Loganathan, 2001). They cannot be seen by naked eyes. They spread through wind and mechanically transfer of the infested nuts from one place to other. Suck the sap under perianth (Mariau, 1977). The economic loss due to the coconut mite in India has been reported as 34% on an average (Nair, 2000). 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 reducing chemical use, considering environmental safety and long term effective management practices against eriophyid mite this research trail was conducted.

MATERIALS AND METHODS

The eriophyid infested nuts were made available from the Asond block, Central Experiment Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. The nuts infested with eriophyid mite were brought in to the laboratory. The bracts of the perianth were removed smoothly. The observations of the live eriophyid mite were recorded from one microscopic field (28.28 mm^2) on the inner surface of the bract under stereo binocular microscope. The required quantity of spray solution was sprayed on the inner surface of the bracts with the help of hand sprayer. The care was taken

to use very little quantity of spray solution to avoid more wetting of bracts. The meristematic region of the nut that got exposed after the removal of bracts as well as the retained bract/s were sheathed with a stretched parafilm up to the green portion of the nut in such a manner that there were no gaps. The treated nuts were incubated under ambient conditions. On 3rd day, the parafilm was unwound and the bracts were opened to observe infected mites on the inner surface of the bracts under a stereozoom microscope. Again the dead mites were counted from one microscopic filed from the bract. The procedure was repeated on 5, 8 and 12 days after spraying of the biopesticides. The fungus was isolated from the infected mites and upon fresh inoculation it could again produce disease in the mites and exhibit the same micro and macro-morphology in culture after the second passage.

The treatment details of the experiment were as follows,

Treatments details

T_1 Application of *Hirsutella thompsoni* @ 5 g/ lit.

T_2 Application of *Beauveria bassiana* @ 5 g/ lit.

T_3 Application of *Verticillium lecanii* @ 5 g/ lit.

T_4 Application of *Metarrhizium anisopliae* @ 5 g/ lit.

T_5 Application of *Paecilomyce fairnescence* @ 5 g/ lit.

T_6 Application of Neem oil 20 ml/lit.

T_7 Application of Neem azal 5 % @ 0.8 ml/ lit.

T_8 Application of Neem azal 1 % @ 4 ml / lit.

T_9 Water spray

Observations recorded

The live mites from one microscopic field were recorded before imposing treatments of the biopesticides. The dead mites were counted at 3, 5, 8 and 12 days after imposing treatments. The cumulative dead mites were taken into consideration for total dead mites at each observation. All the mites died on 12th day after treatment and the bracts of the perianth were full of fungus. The data on cumulative dead mites was converted into " n + 1 values and analyzed statistically.

RESULTS AND DISCUSSION

The data on laboratory study on eco-friendly management of coconut eriophyid mite with biopesticides are presented in Table 1 and graphically depicted in Fig. 1. The data showed non-significant results during pre-treatment.

On third day after treatment the maximum mite mortality (22.00) was recorded in treatment T_1 (application of *Hirsutella thompsoni* @ 5 g/ lit.) which was at par with treatment T_2 (application of *Baeuveria bassiana* @ 5 g/ lit.) and T_6 (application of Neem oil 20 ml/lit.) showing 8.75 and 8.50 mite mortality, respectively. The other treatments were at par with each other. While the lowest mite mortality were recorded in treatment T_9 (0.25) *i.e.* water spray.

Five days after application the treatment T_1 (application of *H. thompsoni* @ 5 g/ lit.) recorded maximum mite mortality (32.25) which was at par with T_6 (application of Neem oil 20 ml/lit.), T_3 (application of *Verticillium lecanii* @ 5 g/ lit.), T_2 (application of *Baeuveria bassiana* @ 5 g/ lit.) showing 11.50, 11.00 and 10.25 mortality whereas treatment T_9 (water spray) showed lowest (1.25) mite mortality.

Eight days after application the treatment T_1 (application of *H. thompsoni* @ 5 g/ lit.) recorded maximum mite mortality (38.75%) which was at par with T_3 (application of *V. lecanii* @ 5 g/ lit.), T_6 (application of Neem oil 20 ml/lit.) and T_2 (application of *B. bassiana* @ 5 g/ lit.) showing 12.75, 12.50 and 12.25 mortality whereas treatment T_9 (water spray) showed lowest (2.25%) per cent mite mortality.

The results of present finding are similar with the earlier workers. Ramarethinam Loganathan (2001) reported that nimbecidine in combination with one or more entomopathogenic fungi like *Hirsutella thompsoni*, *Verticillium lecanii* (Zimmeran) *Vieges* and *Paecilomyces* sp. in 200 litres of water was found better for mite control in coconut. Rabindra and Shreerama Kumar (2003) concluded that *H. thompsoni* was found to be a one of the best fungus for controlling perianth mite. The myco-acaricide *i.e* Mycohit first Indian myco-acaricide developed by PDBC, Bengaluru was recommended as 1 kg of Mycohit in 100 litre of water for 50 trees at 15 days interval thrice in a year. Mikunthan and Manjunatha (2004) evaluated bio-rationals such as Azadirachtin *Fusarium semitectum*, *Fusarium* sp. isolates GM15, *Lecanicillium lecanii*, *Beauveria bassiana*, *Metarrhizium anisopliae*, and *Trichoderma viride*, plus regularly used pesticide Abamectin for their impact on *A.*

Table 1: Effect of Biopesticides on coconut eriophyid mite under laboratory conditions

Treatment	No. of live mites	Cumulative dead mites		
	Pre-treatment	3 DAT	5 DAT	8 DAT
T_1	20.75(4.66) *	22.00(4.31)	32.25(4.97)	38.75(5.59)
T_2	22.25(4.82)	8.75(2.96)	10.25(3.12)	12.25(3.35)
T_3	21.00(4.68)	2.50(1.74)	11.00(3.15)	12.75(3.52)
T_4	21.25(4.71)	3.75(2.01)	4.75(2.24)	7.00(2.67)
T_5	19.75(4.55)	1.50(1.52)	9.50(2.71)	10.75(3.03)
T_6	22.50(4.85)	8.50(2.63)	11.50(3.19)	12.50(3.37)
T_7	21.5(4.73)	0.75(1.29)	2.75(1.91)	4.75(2.36)
T_8	18.75(4.44)	1.75(1.60)	3.00(1.96)	3.75(2.16)
T_9	18.75(4.44)	0.25(1.10)	1.25(1.47)	2.25(1.80)
SE ±	0.13	0.60	0.84	0.84
CD at 5 %	NS	1.74	2.42	2.39

*Figures in the parenthesis are "n + 1 transformed values

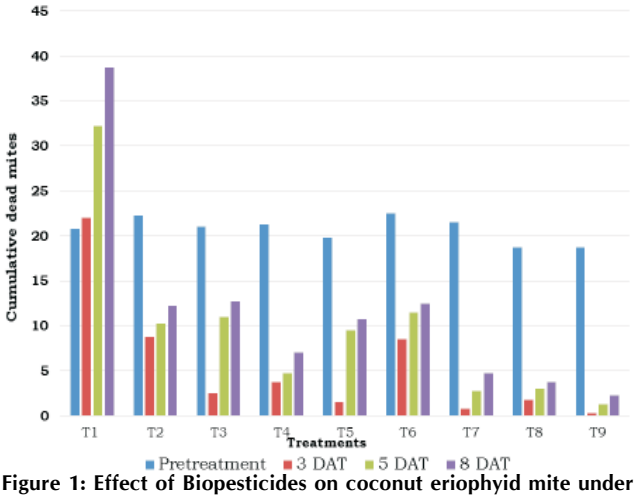

Figure 1: Effect of Biopesticides on coconut eriophyid mite under laboratory conditions

guerreronis. Azadirachtin (66%) was the next most effective. To establish an eco-friendly management of *A. guerreronis*, the two isolates of *Fusarium* sp. seem the best bio-rationals. Kalmath (2007) studied the efficacy of *H. thompsoni* on mite, *T. urticae* and *A. guerreronis* under laboratory condition by using six different isolates. Among the six isolates HTCM – Mysore at 1.8 x 10^8 conidia/ ml against *A. guerreronis* gave highest of 88.63 per cent mortality after five days of spraying. Sreerama Kumar (2009) studied *H. thompsoni* as a myco-acaricide for *A. guerreronis* on coconut in India. Spraying of the product, Mycohit on young bunches resulted in high fungus-associated mortality of the mite in many locations. Nasrin Akter *et al*. (2014) concluded that *H. thompsoni, H. nodulosa* and *Paecilomyces* sp. are found to infect both *A. guerreronis* in coconut and *Phyllocoptructa oleivora* in citrus, whereas other pathogens like *Sporothrix fungivorum, Lecanicillium* (*Verticillium) lecanii* are recorded to infect *Aceria guerreronis*. Bagde *et al*. (2014) revealed that treatment which comprises spraying and root feeding of Neemazal 5 % (T5) found most effective followed by treatment T4 [Neemazal 1% (Spray) + Neemazal 5% (Root feeding)], T8 [Neemazal 5% (Spray)] and T3 [Neemazal 1% (Spray) + Neemazal 1% (Root feeding)] in management of eriophyid mite population.

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