Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(3): 1214-1217

Received: 01-03-2019
Accepted: 05-04-2019

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Extent of nut damage by coconut eriophyid mite, *Aceria guerreronis* Kiefer under South Gujarat condition

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Abstract
An experiment were carried out during 2017-18 and 2018-19 to evaluate different bio-pesticides against A study on extent of nut damage by coconut eriophyid mite, *A. guerreronis* was carried out at the coconut plantation of Regional Horticulture Research Station, ASPEE College of Horticulture and Forestry, NAU, Navsari on coconut variety of West Cost Tall during the year 2017-18 and 2018-19. The overall average data on per cent nut damage during two consecutive years revealed that the per cent distribution of nuts in different grades based on nut surface area damaged *viz*., 19.88 per cent nuts (Grade - 1), 23.27 per cent nuts (Grade - 2), 27.54 per cent nuts (Grade - 3), 18.65 per cent nuts (Grade - 4) and 10.43 per cent nuts (Grade - 5). Whereas, the maximum per cent of damaged nuts (27.54%) was belongs to Grade - 3 damage category (26 to 50 per cent nut surface area damaged) and mean damage grade index was 1.76 (*i.e.* intensity of nut damage was moderate).

Keywords: Coconut, *A. guerreronis*, damage potential and mean damage grade index

1. Introduction
The coconut tree (*Cocos nucifera* L.) is a member of the palm tree belongs to family Arecaceae one of the traditional crop known as "Kalpavriksha" which means the tree that provides all the necessities of life. In India total coconut growing area were 2.082 million hectare with the production of 23904.10 million nuts and productivity of 11481 nuts/ha whereas, in Gujarat total area was 24.44 thousand hectare with the production of 336.65 million nuts and productivity of 13775 nuts/ha, which holds 7th rank in India (Anonymous, 2017) [1]. In Navsari district (Gujarat), total coconut growing area was 554 hectare with an production of 46.65 lakh nuts and productivity of 8421 nuts/ha (Anonymous, 2016) [2].
Among the various pests, coconut eriophyid mite, *Aceria guerreronis* Kiefer is a serious mite pest and these mites live by sucking the sap from tender meristematic tissues of nuts. The damage initially appears as a triangular patch at the level of the perianth, when the nut grows this injury on the nuts leads to warting and longitudinal fissures on the nut surface. This mite species was first described in 1965 from specimen of Guerrero state, Mexico (Keifer, 1965) [3]. In India this pest was first time reported from Ernakulam district of Kerala in 1998, later onwards it has attained a major pest status in the three peninsular states of India namely Kerala, Karnataka and Tamil Nadu and it has spread northwards menacingly and it has drawn national attention as a threat to the coconut plantation (Sathiamma *et al.*, 1998) [4]. In India during 1998 the pest outbreak was reported, almost 85 to 90 per cent of the nuts were showing malformation and reduction in size (Nair, 2000) [5] and 30.94 per cent in terms of copra and 41.74 per cent in terms of husk production (Muralidharan *et al*., 2001) [6]. The estimated yield losses upto 31.54 per cent was reported from St. Lucia by Moore *et al.* (1989) [7] and 70 per cent from Venezuela by Doreste (1968) [8] and average loss in copra yield to the tune of 27.5 per cent in Tamil Nadu by Ramaraju *et al.* (2001) [9]. A reduction in copra yield ranging from 18 to 42 per cent was observed when severe infestation symptoms were seen on more than 50 per cent of the surface area of infested nuts (Mallik *et al.*, 2003) [10]. Mite damage caused significant reduction in quality of fiber from moderate to severely infested nuts suffered 26 to 53 per cent reduction in length (Naseema *et al.*, 2003) [11]. An outbreak of eriophyid mite on coconut in South Gujarat was observed, around 84 per cent of the palms were infested and approximately 79.80 per cent of the marketed nuts in Gadat of Navsari districts were damaged. This was thought to be first report of eriophyid mite infestation in Gujarat (Desai *et al*., 2003)[12].

The pest was already reported in the state of Gujarat, particularly in South Gujarat. But there is limited availability of literature on intensity of nut damage. In this context the study was aimed to assess the intensity of nut damage caused by coconut eriophyid mite under South Gujarat condition.

2. Material and Methods

A. Experimental site and location

The field experiment was carried during 2017-18 and 2018-19 at coconut plantation of Regional Horticulture Research Station, ASPEE College of Horticulture and Forestry, N.M. College of Agriculture, Navsari Agriculture University, Navsari (Gujarat) is located at 13 km away in the East from the village Dandi on Arabian seashore at 27˚ 57 N latitude, 72˚ 54 E longitude and at an altitude of 10 m above the Mean Sea Level (MSL). The climatic condition of Navsari was typically of tropical in nature exhibiting fairly hot summer, mild cold winter and more humid and warm monsoon.

B. Observations

Twenty palms were marked from the field randomly and observations on total number of harvested nuts and number of infested nuts per palm was recorded at three months interval during 2017-18 and 2018-19. Per cent nut infestation was calculated by using following formula,

$$\text{Per cent nut infestation} = \frac{\text{Total number of infested nuts}}{\text{Total number of nuts observed}} \times 100$$

The per cent nut surface infestation was calculated by using grade wise nut surface infestation as given by Devi and Umapathy (2014) [13].

Grade	Intensity of damage	Per cent visible nut surface area damaged
1	No infestation	0
2	Low infestation	1 – 25
3	Medium infestation	26 – 50
4	High infestation	51 – 75
5	Severe infestation	More than 75

Mean damage grade index (MDGI) scale and formula for coconut eriophyid mite was worked out as per Bagde *et al*. (2015) [14].

Per cent damage on nut surface	Scale	MDGI	Intensity
Nuts with no mite damage	0	0	Nil
1 – 25	1	0.1 – 1.0	Mild
26 – 50	2	1.1 – 2.0	Moderate
51 – 75	3	2.1 – 3.0	High
> 75	4	3.1 – 4.0	Severe

Mean damage grade index (MDGI) =

$$\frac{(G0 \times N1) + (G1 \times N2) + (G2 \times N3) + (G3 \times N4) + (G4 \times N5)}{N1 + N2 + N3 + N4 + N5}$$

Where

G_0 to G_4 = Damage scale number (*i.e.* 0 to 4)

N_1 to N_5 = Number of nuts exhibiting particular damage

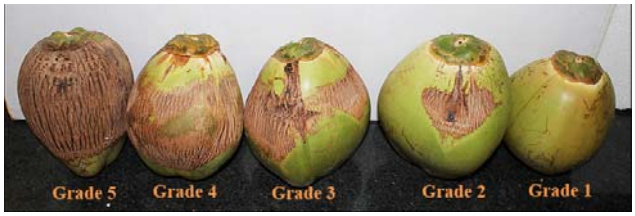

Plate 1: Nuts damaged by coconut eriophyid mite showing different damage grade

3. Results

i) March 2017 to February 2018

During the first year (Table 1) it was noted that the 80.35 per cent of total harvested nuts showing damage symptoms caused by *A. guerreronis* and these nuts were belonging to the mean damage grade index of 1.72 (Moderate infestation). Whereas, per cent distribution of nuts in different damage categories based on nut surface area damaged by coconut eriophyid mite *viz*., 19.67 per cent nuts belongs to Grade – 1 (0% nut surface area damaged), 23.97 per cent nuts belongs to Grade – 2 (1 to 25% nut surface area damaged), 27.31 per cent nuts belongs to Grade – 3 (26 to 50% nut surface area damaged), 19.21 per cent nuts belongs to Grade – 4 (51 to 75% nut surface area damaged) and 9.81 per cent nuts belongs to Grade – 5 (> 75% nut surface area damaged). However; maximum per cent of damaged nuts (27.31%) was belongs to the Grade - 3 damage category.

ii) March 2018 to February 2019

During the second year (Table 1) the 79.78 per cent of total harvested nuts showing damage symptoms caused by *A. guerreronis* and these nuts were found with mean damage grade index of 1.77 (Moderate infestation). The per cent distribution of nuts in different damage grades based on nut surface area damaged *viz*., 20.14 per cent nuts belongs to Grade – 1 damage category, 22.37 per cent nuts belongs to Grade – 2 damage category, 28.32 per cent nuts belongs to Grade – 3 damage category, 17.91 per cent nuts belongs to Grade – 4 damage category and 11.24 per cent nuts belongs to Grade – 5 damage category, however; the maximum per cent of damaged nuts (28.32%) was belongs to the Grade - 3 damage category.

iii) Overall pooled

From the overall average data (Table 1), it was found that 79.91 per cent of total harvested nuts showing damage symptoms caused by *A. guerreronis* and these nuts were belonging to the mean damage grade index of 1.76 (Moderate infestation) whereas, per cent distribution of nuts in different damage grades based on nut surface area damaged *viz*., 19.88 per cent nuts belongs to Grade – 1 damage category, 23.27 per cent nuts belongs to Grade – 2 damage category, 27.54 per cent nuts belongs to Grade – 3 damage category, 18.65 per cent nuts belongs to Grade – 4 damage category and 10.43 per cent nuts belongs to Grade – 5 damage category while, the maximum per cent of damaged nuts (27.54%) was belongs to Grade – 3 damage category (26 to 50 per cent nut surface area damaged).

Table 1: Distribution of nuts in different damage grades in infested palms during 2017-18, 2018-19 and pooled

Year	Total number of harvested nuts/20 palm/year	Total number of infested nuts/20 palm/year	% Nut infestation	Grade wise nut surface infestation				
				0%	1 - 25%	26 - 50%	51 - 75%	> 75%
2017-18	5890	4733	80.35	19.67	23.97	27.31	19.21	9.81
2018-19	4537	3600	79.78	20.14	22.37	28.32	17.91	11.24
(Pooled)	10427	8333	79.91	19.88	23.27	27.54	18.65	10.43

4. Discussion

From the present study the overall average of 79.91 per cent of harvested nuts were showed damaged symptoms which caused by coconut eriophyid mite, *A. guerreronis* (Table 1), however, the maximum number of harvested nuts (27.54%) were belongs to Grade - 3 damage category (26 to 50 per cent nut surface area damaged), while damaged nuts were belonging to the mean damage grade index of 1.76 (nuts showed medium level infestation).

The present results were more or less agreement with past findings of Desai *et al.* (2003) [12] who reported approximately 79.80 per cent of the marketed nuts in Gadat and Navsari distrcits, South Gujarat were damaged by the eriophyid mite. Chalpathirao *et al*. (2005) [15] observed difference of 26.42 per cent decrease in nut size, 51.29 per cent in husk weight, 40.37 per cent in copra weight and 46.15 per cent in oil weight was observed between Scale - I and Scale - V damaged nuts. Similarly, Pushpa and Nandihalli (2009) [16] who recorded higher per cent damaged nuts (92.51%) at Dharwad, Karnataka. Further, Bagde and Pashte (2014) [17] reported highest per cent nut infestation was in Thane district were belongs to Grade III damage category whereas, in Sindhudurg, Ratnagiri and Raigad districts the infested nuts belong to Grade II damage category. Gurav *et al.* (2014) [18] reported eriophyid mite infestation ranged from 43.95 to 48.47 per cent in all coconut growing districts of Konkan region of Maharashtra but intensity of mite was mild to medium.

5. Conclusion

A. guerreronis has so far been a difficult pest to manage in India. Due to their concealed feeding habit near perianth region resulted in severe nut fall occurs in young age while in older nuts infestation results in cracking of fruits as well as warting and longitudinal fissures on the nut surface which leads to reduction in husk quality and other nut components.

6. Acknowledgement

The authors are thankful to the Principal, N.M. College of Agriculture, NAU, Navsari; Principal, ASPEE College of Horticulture and Forestry and Department of Agricultural Entomology, N.M. College of Agriculture, NAU, Navsari (Gujarat) for providing the necessary facilities.

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