

A SURVEY OF INFESTATION OF COCONUT ERIOPHYID MITE, ACERIA GUERRERONIS KEIFER IN KONKAN REGION OF MAHARASHTRA (INDIA)

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ABSTRACT

The coconut eriophyid mite was reported to cause damage in coconut plantations in Konkan region of Maharashtra (India). The survey was conducted in the month of April-May of every year i.e. 2004-05, 2005-06, 2006-07 and 2007-08 in selected villages of four districts of Konkan region. The infestation of eriophyid mites on the basis of per cent palm infestation as well as on the basis of nut infestation was more in Thane district (ranges between 73.23 to 84.40%) followed by Sindhudurg district (33.03 to 86.80%). The nut infestation in Thane district was mostly belongs to Grade III and ranges between 64.16 to 89.42%. The nut infestation in Thane district whereas in Sindhudurg, Ratnagiri and Raigad districts was most of the infested nuts belong to Grade II. However, during survey (2007-08) the highest nut infestation in Grade III was observed in Revedanda, Malgund and Dodamarg villages of Raigad, Ratanagiri and Sindhudurg districts, respectively with 43.45, 30.43 and 69.11 per cent infestation. Survey results can be concluded that the infestation of eriophyid mites to coconut in Thane district had reached to its maximum limit and was found to have started much earlier than in rest of the districts.

INTRODUCTION

The coconut mite, *Eriophyes guerreronis* (Keifer) (Acari: Eriophyidae) is a microscopic organism that breeds under the perianths of coconuts (*Cocos nucifera* Beccari). Due to feeding of growing point, the damaged cells eventually become suberized and hence appear brown (Julia and Mariau, 1979; Hall and Espinosa, 1981). As the nut grows in size, the cells around the damaged area multiply which resulted in reduction of nut size, and a decline in copra output (Julia and Mariau, 1979; Hall and Espinosa, 1981).

Keifer (1965) described first time *Aceria guerreronis* in Mexico infesting coconut fruits. Many people reported the incidence of this mite in various parts of world within tropical and sub tropical regions (Mariau, 1977, Zuluaga and Sanches, 1971; Griffith, 1984; Howard and Abreu-Rodriguez, 1990; Lawson-Balgho et al., 2008; Negloh et al., 2011; Al-Shanfari et al., 2013; Das et al., 2013). Sathiamma et al., (1998) first reported the incidence of *A. guerreronis* in Amballoor Panchayat of Ernakulum district of Kerala (India). The infestation had spread throughout peninsular India and in parts of Pondicherry and Lakshadweep. Prasad and Ranganath (2000) also found the presence of perianth mites' infestation in Andaman. Rao et al., (2001) have reported the incidence of eriophyid mite *A. guerreronis* on coconut (*Cocos nucifera*) for the first time in costal Orissa. The affected area estimated by several workers in the states like Tamil Nadu, Karnataka and Andhra Pradesh (Haq, 1999; Ramaraju et al., 2000; Reddy and Naik, 2000,

Nair, 2000; Arulmozhi et al., 2002; Kirathiga et al., 2002; Nair et al., 2002; Natarajan et al., 2002; Ramaraju et al., 2002; Rethinam et al., 2003; Ramaraju et al., 2003; Sujatha and Rao, 2004; Sumangala and Haq, 2005; Pushpa, 2006, Sujatha et al., 2008; Begum and Babu, 2013).

In the recent past, the pest has spread rapidly to all coconut growing areas of India (Muthiah, 2007). Naik (2003) revealed that the per cent infestation of palm varied from 8.33 (Sathpathi village of Palghar tahsil) to 80 per cent (Arnala village of Vasai tahsil) and 31.56 per cent palms were affected by mite in Thane district of Maharashtra State. The infestation was higher in Vasai tahsil (78.70%), followed by Palghar (52.86%) and Dhanu (24%). Out of total palms, 41.09 per cent palms were free from mite, while 42.77 per cent palms were moderately affected and 16.41 per cent palms were severely affected by mites (Sarmalkar, 2004).

The pest is recently reported in the state of Maharashtra, particularly in the Konkan region. But there is limited availability of literatures on extent of incidence and management practices. In this context the study was aimed to assess the infestation and spread of the coconut mite in coastal zone of Maharashtra.

MATERIALS AND METHODS

Survey of coconut mite in Konkan

Location of the survey

The villages where selected randomly from each district for

Table 1: Per cent infestation of palms during the year 2004 -05 to 2007 -08

District / Place	Average per cent infested palms			
	2004-05	2005-06	2006-07	2007-08
Thane				
Vasai	81.40	81.60	83.65	82.60
Kelwa	83.53	82.39	83.23	81.18
Mahim	82.96	84.40	80.71	80.90
Dahanu	73.23	76.38	77.67	75.24
Raigad				
Murud	30.07	32.40	34.51	37.48
Shirivardhan	31.08	31.84	33.45	35.46
Ravedanda	32.89	34.90	36.61	40.00
Ratnagiri				
Guhagar	24.02	34.34	36.46	38.63
Ganpatipule	29.97	33.58	46.51	50.91
Bhatye	31.35	36.44	38.97	39.00
Malgund	65.81	62.38	61.19	61.68
Sindhudurg				
Malvan	36.31	41.97	62.07	66.92
Vengurla	42.48	50.53	78.51	83.25
Dodamarg	33.03	46.04	80.20	86.80

Table 2: Per cent nut infestation during the year 2004 -05 to 2007 -08

District / Place	Average per cent infested nuts			
	2004-05	2005-06	2006-07	2007-08
Thane				
Vasai	79.42	80.21	82.20	89.42
Kelwa	72.56	73.41	79.00	82.56
Mahim	64.80	64.16	77.45	84.80
Dahanu	70.88	71.66	79.45	76.88
Raigad				
Murud	33.13	32.28	35.10	33.13
Shirivardhan	20.74	24.08	28.76	30.74
Ravedanda	44.85	53.58	58.43	64.85
Ratnagiri				
Guhagar	26.88	28.14	33.43	36.88
Ganpatipule	41.21	45.24	49.10	47.21
Bhatye	27.86	29.55	36.15	37.86
Malgund	40.13	41.27	45.66	50.13
Sindhudurg				
Malvan	49.79	51.80	54.28	69.79
Vengurla	48.48	50.68	60.27	78.48
Dodamarg	64.00	77.94	83.33	84.00



Figure 1: India Outline Map

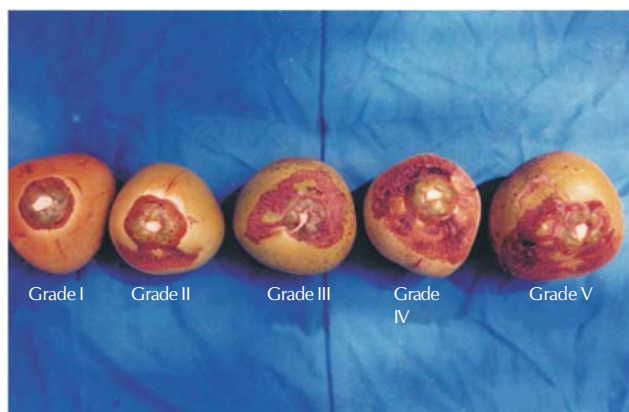


Plate 1: Nuts showing the infestation of eriophyid mite in different grades

recording the observations and data on eriophyid mite infestation (%) and intensity of eriophyid mite infestation were recorded. The selected villages belong to Konkan region of Maharashtra state which is located in the south-western zone of India. Konkan is a coastal region besides Arabian Sea with red lateritic soil, and warm and humid climate. The region is rich with plenty of coconut gardens from the years. Survey about coconut mite infestation was done during four years separately by visual observation scoring method as the standard method prescribed by Muralidharan *et al.* (2001), Girisha (2005) and Julia and Mariau (1979).

District wise villages selected for survey

Name of District with Villages Selected geographic position			
Thane [19.1724° N, 72.9570°E]	Vasai	Kelva	Mahim Dahanu
Raigad [18.6500° N, 72.8800°E]	Shrivardhan	Revdanda	Murud
Ratanagiri [16.9800° N, 73.3000°E]	Bhatye	Ganpatipule	Guhagar
Sindhudurg [19.0828° N, 72.8334°E]	Malvan	Vengurla	Dodamarg

Method of recording observations

The survey was conducted in the month of April-May of every year i.e. 2004-05, 2005-06, 2006-07 and 2007-08 in selected villages of four districts of Konkan region. A total of 14,000 coconut palms from Konkan region were observed in per year up to 4 year duration. The per cent eriophyid mite infestation was calculated by using following formula (Julia and Mariau, 1979)

$$\text{Per cent Plan infestation} = \frac{\text{No of infested palms in village}}{\text{Total no of palms observed in a village}} \times 100$$

Similarly, in the month of April-May every year, total number of harvested nuts and number of infested nuts were recorded. The per cent nut infestation was calculated by using following formula (Julia and Mariau, 1979)

$$\text{Per cent nuts infestation} = \frac{\text{No of infested nuts in village}}{\text{Total no of nuts harvested in a village}} \times 100$$

Table 3: Distribution of nuts in different grades in infested palms during 2004-05

District / Place	Total no. Of nuts observed	Per cent infested nuts								Total % of infestedpalms
		Free		Grade I		Grade II		Grade III		
Thane		No.	%	No	%	No	%	No	%	
Vasai	690	142	20.57	148	21.44	167	24.20	233	33.76	79.42
Kelva	390	105	26.92	47	12.05	87	22.30	149	38.20	72.56
Mahim	375	132	35.20	42	11.20	103	27.46	98	26.13	64.80
Dahanu	450	134	29.77	133	29.55	147	32.66	66	14.66	76.88
Raigad										
MurudJanjira	501	335	66.86	131	26.14	25	4.9	10	1.99	33.13
Shriwardhan	540	427	79.07	76	14.07	25	4.62	11	2.03	20.74
Revdanda	531	399	75.14	105	19.77	21	3.95	6	1.12	24.85
Ratnagiri										
Guhagar	432	345	79.86	53	12.26	34	7.87	0	0	20.13
Ganpatipule	465	340	73.11	63	13.54	32	6.88	30	6.45	26.88
Bhayte	384	277	72.13	62	16.14	43	11.19	2	0.5	27.86
Malgund	558	328	58.78	157	28.13	46	8.24	27	4.83	41.21
Sindhudurg										
Malwan	498	250	50.20	197	39.55	46	9.23	5	1.00	49.79
Vengurle	561	320	57.04	188	33.51	57	10.16	27	4.81	48.48
Dodamarg	375	285	76.04	55	14.66	35	9.33	0	0.0	24

Table 4: Distribution of nuts in different grades in infested palm 2005-06

District / Place	Total no. of nuts observed	Per cent infested nuts								Total % of infested palms
		Free		Grade I		Grade II		Grade III		
Thane		N.	%	No	%	No	%	No	%	
Vasai	662	131	19.78	136	20.54	164	24.77	231	34.79	80.21
Kelva	395	105	26.58	55	13.92	79	20.00	156	39.49	73.41
Mahim	346	124	35.83	73	21.09	79	22.83	70	20.23	64.16
Dahanu	420	117	27.85	111	26.42	108	25.71	82	19.52	71.66
Raigad										
MurudJanjira	477	318	66.66	112	23.48	34	7.12	8	1.67	32.28
Shriwardhan	503	405	80.51	62	12.32	23	4.75	11	2.18	19.08
Revdanda	496	379	76.41	87	17.54	19	3.83	11	2.21	23.58
Ratnagiri										
Guhagar	412	329	79.85	40	9.70	38	9.22	5	1.21	20.14
Ganpatipule	439	315	71.75	52	11.84	43	9.79	29	6.60	28.24
Bhayte	352	255	72.44	45	12.78	40	11.36	12	3.40	27.55
Malgund	516	302	58.52	145	28.10	42	8.13	26	5.03	41.27
Sindhudurg										
Malwan	471	227	48.19	183	38.85	50	10.61	11	2.33	51.82
Vengurle	511	266	52.05	174	34.05	51	9.98	34	6.65	50.68
Dodamarg	340	246	72.35	38	11.17	47	13.82	10	2.94	27.94

Amongst the harvested nuts, the infested nuts were also graded on the basis of visual scoring method given by Murlidharan et al., (2001)

Grade	Surface damage
Free	No symptoms of mite
Grade I	1-25 % of nut surface damaged by mite
Grade II	26-50 % of nut surface damaged by mite
Grade III	Above 50 % nut surface damaged by mite

RESULTS AND DISCUSSION

Survey of eriophyid mite in Konkan region

Infestation of eriophyid mite based on per cent palms infested

From the overall results (Table 1), it was revealed that the maximum palm infestation due to eriophyid mite was in Thane district followed by Sindhudurg district. In Thane district the per cent infested palms were higher in the initial year of survey (2004- 05) which were slightly increased in the next three years. Whereas in Raigad, Ratanagiri and Sindhudurg districts the per cent palm infestations in the initial year of survey were comparatively low which were increased in the more proportion in the next three years.

The present findings are more or less in confirmatory with Naik (2003) who observed the per cent infestation of palm ranged from 8.33 per cent to 80 per cent in Thane district during the year 2002, and Sarmalkar (2004) who observed the per cent infestation of palm ranged from 6.67 per cent to

Table 5: Distribution of nuts in different grades in infested palm 2006-07

District / Place	Total no. of nuts observed	Per cent infested nuts								Total % of infested palms
		Free		Grade I		Grade II		Grade III		
		No.	%	No	%	No	%	No	%	
Thane										
Vasai	640	114	17.8	152	23.75	146	22.81	228	35.64	82.20
Kelva	426	89	21	56	13.15	87	20.42	194	45.43	79.00
Mahim	384	87	22.55	48	12.50	108	28.13	141	36.83	77.45
Dahanu	468	96	20.55	147	31.41	152	32.48	73	15.56	79.45
Raigad										
MurudJanjira	482	313	64.9	125	25.93	32	6.64	12	2.53	53.10
Shriwardhan	463	330	71.24	84	18.14	37	7.99	12	2.63	28.76
Revdanda	452	188	41.57	118	26.11	28	6.19	118	26.13	58.43
Ratnagiri										
Guhagar	473	315	66.57	68	14.38	35	7.40	55	11.65	33.43
Ganpatipule	528	269	50.90	157	29.73	53	10.04	49	9.33	49.10
Bhayte	397	253	63.85	35	8.82	48	12.09	61	15.24	36.15
Malgund	421	229	54.34	64	15.20	39	9.26	79	21.19	45.66
Sindhudurga										
Malwan	487	223	45.72	187	38.40	48	9.86	29	6.03	54.28
Vengurle	583	232	39.73	203	34.82	60	10.29	88	15.16	60.27
Dodamarg	356	59	16.67	57	16.01	38	10.67	202	56.64	83.33

Table 6: Distribution of nuts in different grades in infested palm 2007-08

District / Place	Total no. of nuts observed	Per cent infested nuts								Total % of infested palms
		Free		Grade I		Grade II		Grade III		
		No.	%	No	%	No	%	No	%	
Thane										
Vasai	652	69	10.58	142	21.78	156	23.93	285	43.71	89.42
Kelva	385	67	17.44	62	16.10	84	21.82	172	44.64	82.56
Mahim	338	51	15.2	68	20.12	82	24.26	137	40.42	84.80
Dahanu	415	96	23.12	106	25.54	112	26.99	101	24.35	76.88
Raigad										
MurudJanjira	463	310	66.87	108	23.33	36	7.78	9	2.03	33.13
Shriwardhan	498	345	69.26	66	13.25	28	5.62	59	11.86	30.74
Revdanda	500	176	35.15	84	16.80	23	4.60	217	43.45	64.85
Ratnagiri										
Guhagar	432	273	63.12	56	12.96	40	9.26	63	14.66	36.88
Ganpatipule	521	275	52.79	137	26.30	44	8.45	65	12.47	47.21
Bhayte	346	215	62.14	46	13.29	38	10.98	47	13.58	37.86
Malgund	406	202	49.87	38	9.36	42	10.34	124	30.43	50.13
Sindhudurg										
Malwan	470	142	30.21	142	30.21	34	7.23	152	32.34	69.79
Vengurle	503	108	21.52	138	27.44	51	10.14	206	40.91	78.48
Dodamarg	329	53	16.00	23	6.99	26	7.90	227	69.11	84.00

85.00 per cent in Thane district during the year 2003. The results are close to agreement that the infestation of eriophyid mite in Thane district must be started much earlier followed by Sindhudurg, Ratanagiri and Raigad districts (Desai *et al.*, 2009).

Infestation of eriophyid mite based on per cent nuts infested

Similar trend observed here (Table 2) as the palm infestation by mites (Table 1). In Thane district infestation was reached to its maximum limit as compared to Sindhudurg, Ratanagiri and Raigad districts as there was very slight increase was observed in the per cent nut infestation after three years (2007-08). In Sindhudurg, Ratanagiri and Raigad districts the per cent nut infestation was proportionally more increased after three years (2007-08). The present findings are more or less in confirmatory

with Naik (2003) who observed the per cent infestation of palm nuts ranged between 33 per cent and 80 per cent in Thane district and Sarmalkar (2004) who observed the per cent infestation of palm nuts ranged between 67 per cent and 85 per cent in Thane district. The level of infestation of eriophyid mite was highest in Thane district followed by Sindhudurg, Ratnagiri and Raigad (Desai *et al.*, 2009). Also Pushpa (2006) indicated that the mite population occurred in Dharwad area throughout the year with variation during different season of the year. The variations in the range of infestation are may be due to changing environmental as well as biotic stresses.

Grade wise infestation of nuts during the year 2004 -05, 2005-06, 2006-07 and 2007 -08

The grade wise infestation of nuts thus confirms the severity of eriophyid mite infestation to coconut in Thane district, where the infestation was started much earlier than in rest of the districts (Table 3, 4, 5). In rest of the district also, in some of the villages, the infestation of eriophyid mite is slowly reaching to highest limit of infestation due to favourable conditions. Desai *et al.* (2009) also observed that the intensity of infestation of coconut mite and scale index was low in Ratnagiri and Raigadh districts.

In Thane district, tourism is well developed because it is adjoining to Mumbai city. The tender nuts are coming from Kerala and Karnataka state to this area because of the huge demand for tender coconut are the major dispersing agent. Therefore, it is necessary to start control measures to eradicate this pest from the Kokan region as a major threat to coconut plantations.

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