

Scenario of Coconut eriophyid mite infestation in Andhra Pradesh

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Introduction

The coconut eriophyid mite, *Aceria guerreronis* Keifer is the most destructive pest among various species of eriophyid mites on coconut palms in 30 countries of tropical America, Africa and Asia. In India, the coconut eriophyid mite was first reported in Emakulam district of Kerala during 1998. Within a short span of time, the mite had spread to all major coconut growing regions of the country in the East and West coast of India and Lakshadweep Islands. Entry of the mite into the developing nuts takes place during the early phase of development immediately after the pollination. Active colonies of mite are formed by the egg laying female mites gaining entry into the developing nuts. Various developmental stages of the pest viz., eggs, nymphs and adults can be seen in colonies on the meristematic areas under the perianth of developing nuts. Biology of the mite takes 7-10 days and average fecundity of the female mite is 80 eggs. Under favourable conditions this high fecundity and the shorter life cycle help in the enormous multiplication of the colonies. Appearance of triangular yellow patches below the perianth is the first external manifestation of mite infestation on young buttons. Drainage of sap by the feeding activity of the colony results in drying of the tissues causing browning of the affected portion. As the nuts grow, warts and longitudinal fissures appear on the nut surface. Severe infestation causes drying and shedding of buttons or malformation of nuts resulting in retarded growth. Considerable reduction in the copra content (25-30%), malformation of husk fibre (42%) and reduction in oil (31%) are the major economic losses due to severe infestation by the pest. The population of the pest reaches peak during summer months and dispersal of the mite in nature occurs mainly through wind.

In Andhra Pradesh coconut is cultivated in 17 districts in a total area of 1.04 lakh ha. producing 1149 million nuts annually. Among the districts, East Godavari holds 48.06% area (50247 ha.) with a production of 527 million nuts, followed by West Godavari having 19.61% of area (20504 ha.) with a production of 289 million nuts. These two coastal districts together

contribute the major share (71%) of coconut production of the State. The major coconut variety grown in these two Districts is East Coast tall (ECT) which is a tall variety with heavy bearing of small to medium size nuts. Other varieties including dwarfs and hybrids were also cultivated in a limited scale in the state. The productivity of coconut in Andhra Pradesh is found to be very high i.e. 10994 nuts/ha. Eriophyid mite incidence in coconut was first reported from Chittoor area of the state during 1999 and subsequently by 2000 the pest had spread to all the major coconut growing districts of the State. The increased invasion by the pest in all coconut growing tracts and persistent damage symptoms on most of the nuts in recent years warranted an intensified study to assess the status of mite incidence in the State. Accordingly a survey was undertaken during November 2011 to assess the level of mite incidence in the state.

Survey area

The survey for assessing the intensity of mite infestation was conducted in two districts of Andhra Pradesh, viz., East Godavari and West Godavari which form the major coconut growing tract of the State. The climate in these districts is warm and humid almost throughout the year. Average rainfall in the tract was found to range from 800-1100 mm. The soil type is sandy loam along the Coast of Godavari River and clay loam in other areas. From East Godavari district eight mandals and from West Godavari District five mandals were selected for the survey. The locations of survey are furnished in Table -1.

Methodology

A pre-tested pro-forma was used for collecting data. In the survey, one garden from each mandal was selected for recording observation. From Pedavegi mandal two gardens were selected. In each garden the observations were recorded from all the available varieties by selecting 6 sample palms continuously and detailed observations on incidence and intensity of mite were observed with the help of a binocular from the ground. Total number of nuts and number of mite infested nuts in all the bunches that were visible from

Table 1. Surveyed areas in East and West Godavari Districts

East Godavari	West Godavari
Ambajipeta	Tadepalligudem
Ainavilli	Kovvur
Gannavaram	Nidadavole
Razole	Nallajerla
Malkipuram	Vegiwada
Sakhinetipalli	Pedavegi
Rajamundhry Rural	
Mandapeta (Dwarapudi)	

the ground were recorded. In addition, detailed observation on the pest incidence in all the bunches of one palm from each variety available in the garden was recorded with the help of a skilled climber. The observations were recorded from each bunch starting from the first pollinated bunch as number of nuts without mite infestation (healthy), nuts with less than 25% surface damage (low infestation), 25-50% nut surface damage (medium infestation) and more than 51-75% infestation (high) and >75% surface damage, malformed and puny nuts (severe) (Table-2). Data pertaining to the various parameters of the garden mainly profile of the farmer, details of variety, intercrops, soil, nutrition and irrigation status, pest and disease incidence etc were also recorded.

Sample nuts were collected from mite infested palms from eight gardens of East Godavari district and

Gannavaram, Razole, Malkipuram, Sakhinetipalli, Rajamundry rural and Mandapeta (Dwarapudi). Similarly in West Godavari, gardens from Kovvur, Nidadavole, Nallajerla, Vegiwada, Pedavegi and Thadepalligudem were surveyed for studying the mite incidence. All the gardens visited by the team were having mite incidence. The average mite incidence in East Godavari district was found to be 39.63% whereas in West Godavari district there was slight reduction and here the average incidence recorded was 29.81%. In both the districts, intensity of mite infestation was assessed by scoring the infested nuts into various grades viz., low, medium, high and severe infestation as per details given in Table -2. In East Godavari district, 70.53% of nuts were showing only less than 25% of surface damage (low), 25.65% in medium category (25-50% nut surface damage). The other two grades viz., high (51-75% damage) and severe (more than 75% and puny nuts) were negligible with 3.59% in high category and 0.25% in severe category. In West Godavari district, 81.72% of nuts were in low category, 15.88% in medium level, 2.42% nuts in high category and there were no nuts in the severe category. In both these districts, the mite infestation was categorized as low to medium level. When compared to both districts, East Godavari recorded higher incidence as well as higher infestation level on nuts than West Godavari as furnished in the Table -3.

As per earlier studies conducted in CPCRI, only nuts in the higher grade like "high" and "severe" categories were showing economic losses viz., reduction in copra, oil and fiber content and these

Table -2. Details of score showing intensity of mite damage

Infestation intensity category	Degree of damage symptom on nut
Healthy nut	Nuts without any mite damage symptom on the surface
Low	Nuts with less than 25% nut surface damage
Medium	Nuts with 25-50% nut surface damage
High	Nuts with 50-75% nut surface damage
Severe	Nuts with more than 75% nut surface damage and malformed and puny nuts

four gardens of West Godavari district for assessing the mite population as well as natural enemies of mite.

Status of eriophyid mite incidence

In East Godavari district, coconut plantations from the following mandals were assessed for incidence and infestation levels viz., Ambajipeta, Ainavilli,

categories of nuts are found to be negligible in these districts. In totality, the infestation level of nuts in these districts ranged from low to medium which do not cause any economic loss to the farmers.

In East Godavari District the mite incidence ranged from 31.29% to 54.21% with Malkipuram recording the least incidence and Sakhinetipalli the maximum. In

Table - 3. Incidence and infestation level of coconut eriophyid mite in East and West Godavari districts of Andhra Pradesh.

District	Incidence (%)	Infestation level on nuts (%)			
		Low	Medium	High	Severe
East Godavari	39.63	70.53	25.65	3.59	0.25
West Godavari	29.81	81.72	15.88	2.42	0.0

Sakhinetipalli maximum number of nuts were in medium level of infestation whereas in all other mandals in the district maximum nut infestation was under low level category. Only in one garden in Razole mandal few nuts with severe level of infestation were found. Details of the mite incidence and infestation levels of the nuts are summarized in Table 4 and 5.

Coconut palms in West Godavari district showed low level of mite incidence ranging from 18.26% to 39.52% with Thadepalligudem mandal showing the least and Nallajerla mandal recording the highest incidence. About 82% of the infested nuts recorded in the district have low level of infestation and severe level of infestation was not observed on nuts. The details of data collected from the district are furnished in Table 6 and 7.

Variety-wise incidence

During the survey, the team had recorded data on mite incidence from various coconut varieties cultivated in these two districts. The varieties include East Coast Tall (ECT) the Local Tall variety, Chowghat Orange

Dwarf (COD), Malayan Yellow Dwarf,(MYD) Ganga Bondam(GB), Malayan Green Dwarf (MGD) (Dwarf varieties) and hybrid Godavari Ganga (ECT x GB). Data on incidence of mite in different varieties are presented in Table 8.

There was significant difference observed in the percentage of mite infestation among the varieties. The highest infestation was observed in ECT variety (36.07).The infestation was comparatively low in the case of Malayan Green Dwarf and Chowghat Orange Dwarf. The variety ECT, Gangabondam, Malayan Yellow Dwarf and Godavari Ganga are statistically on par with respect to mite incidence.

Population build up of eriophyid mite

Sample nuts from third/fourth bunch were collected from infested palms from eight mandals of East Godavari and four mandals of West Godavari for assessing the mite population. Population was assessed in the laboratory and expressed in mm² area. Mite population from palms in East Godavari ranged from 0.48 to 5.29 per mm² area with a mean of 2.53 per mm² whereas in sample nuts of West Godavari the population showed a decline with values ranging from 0.75 to 2.9 with a mean of 1.64 per mm² area. The mite population details are furnished in Table-9.

Natural enemies

The sample nuts collected from these two districts were observed for presence of natural enemies. Natural enemies encountered comprise mainly

Table - 4. Mite incidence on coconuts in various mandals of East Godavari district

Mandals /area	Total nuts observed (No)	Healthy nuts (No)	Mite infested nuts (No)	% incidence	Infested nuts in different categories (%)			
					Low (<25% surface damage)	Medium (25-50% surface damage)	High (50-75% surface damage)	severe (>75% surface damage)
Ambajipeta	1544	944	600	38.86	61.67	28.83	9.50	0.00
Ainavilli	504	315	189	37.50	79.36	19.05	1.59	0.00
Gannavaram	498	312	186	37.35	69.35	23.12	7.53	0.00
Razole	391	187	204	52.17	66.18	29.45	2.45	1.96
Malkipuum	262	180	82	31.29	90.24	9.76	0.00	0.00
Sakhinettipalli	404	185	219	54.21	43.84	48.86	7.30	0.00
Rajmundry rural	420	276	144	34.29	79.17	20.83	0.00	0.00
Mandapeta (Dwarapudi)	886	608	278	31.38	74.46	25.18	0.36	0.00
Average				39.63	70.53	25.65	3.59	0.25

Table - 5. Number of nuts in various grades in different mandals of East Godavari district

Area	Number of nuts			Number of nuts in various grades			
	Total nuts observed	Healthy nuts	Mite Infested nuts	Low	Medium	High	Severe
Ambajipeta	1544	944	600	370	173	57	0
Ainavilli	504	315	189	150	36	3	0
Gannavaram	498	312	186	129	43	14	0
Razole	391	187	204	135	60	5	4
Malkipuram	262	180	82	74	8	0	0
Sakhinetipalli	404	185	219	96	107	16	0
Rajmundry rural	420	276	144	114	30	0	0
Mandapeta (Dwarapudi)	886	608	278	207	70	1	0

Table - 6. Mite incidence on coconuts in various mandals of West Godavari district

Mandals / area	Total nuts observed (No)	Healthy nuts (No)	Mite infested nuts (No)	% incidence	Infested nuts in different categories (%)			
					Low (<25% surface damage)	Medium (25-50% surface damage)	High (50-75% surface damage)	severe (>75% surface damage)
Kovvur	427	259	168	39.34	77.98	19.64	2.38	0.00
Nidadavole	420	279	141	33.57	80.85	19.15	0.00	0.00
Nallajerala	716	433	283	39.52	72.44	26.86	0.70	0.00
Vegiwada	841	594	247	29.36	85.88	13.32	0.91	0.00
Pedavegi	801	650	151	18.85	98.01	1.99	0.00	0.00
Thadepalligudem	1720	1406	314	18.26	75.16	14.33	10.51	0.00
Average				29.81	81.72	15.88	2.42	0.00

Table - 7. Number of nuts under various categories in different mandals of West Godavari district

Mandals / area	Number of nuts			Number of nuts in various grades			
	Total nuts observed	Healthy nuts	Mite infested nuts	Low	Medium	High	Severe
Kovvur	427	259	168	131	33	4	0
Nidadavole	420	279	141	114	27	0	0
Nallajerala	716	433	283	205	76	2	0
Pedavegi	801	650	151	148	3	0	0
Vegiwada ECT	841	594	247	200	44	3	0
Thadepalligudem	1720	1406	314	236	45	33	0

Table -8. Percentage of mite infestation in various coconut varieties

Variety	Percentage of infestation	
	Original	Transformed
East Coast Tall	36.065	36.384
Chowghat Orange Dwarf	16.188	20.371
Gangabondam	31.873	33.878
Malayan Yellow Dwarf	26.060	29.297
Godavari Ganga	29.480	31.790
Malayan Green Dwarf	11.062	19.314
S.E/plot		16.09
Gen.Mean		33.26
CV		48.38
Av. C.D (p=0.05)		16.34



East Coast Tall (ECT), local coconut variety in Andhra Pradesh

Chowghat Orange Dwarf (COD), coconut variety with low level of mite incidence

coconut monocropping and 9 gardens with multiple cropping with mixed/inter crops like cocoa, arecanut, banana and ornamental plants. The percentage of mite incidence in both these cropping systems was compared statistically to ascertain whether there is any increase or decrease of mite incidence in the cropping systems. The data analyzed revealed that there is no significant difference in mite incidence between the gardens following monocropping and inter/mixed cropping. The details are presented in Table -10.

Incidence of eriophyid mite in gardens with inter/mixed crops

The data on mite incidence in various gardens following multiple cropping with inter/mixed crops was analyzed to ascertain whether any of the inter/mixed crops influence the incidence of eriophyid mite. It was observed that gardens where flowering plants were intercropped with coconut, the eriophyid mite incidence was significantly low when compared to gardens with other inter/mixed crops. Gardens with arecanut, banana and cocoa as inter/mixed crops were on par in the mite incidence with highest incidence of mite recorded in gardens with arecanut as mixed crop. Details are furnished in Table -11.

predatory mites. The phytoseiid predatory mite *Neoseiulus baraki* was observed in 72.4% of the sample nuts. Other predatory mites observed in very few numbers include *Bdella* sp. and *Chelacaropsis moorei*. The predatory mite population per nut ranged from 2 to 17 in East Godavari District where as the population ranged from 2 to 10 in West Godavari. The average population in both the districts did not show any difference (7.18 to 7.62). However, presence of the potential biocontrol agent of the mite, the acaropathogenic fungus *Hirsutella thompsonii*, was not observed in the sample nuts collected.

Mite incidence levels in cropping systems

During the survey we have covered 5 gardens with

Table- 9. Eriophyid mite and predator population in sample nuts collected from various mandals

East Godavari areas	Mite population/ mm ²	Average predator population/nut	West Godavari areas	Mite population/ mm ²	Average predator population/nut
Ambajipeta	1.7	4.0	Nallajerla	2.9	10
Ainavilli	5.29	15.0	Nidadavole	1.3	9.5
Gannavaram	5.03	17.0	Kovvur	0.75	2.0
Dwarapudi	1.35	6.5	Pedavegi	1.6	9.0
Razole	2.54	9.0			
Malkipuram	1.3	2.0			
Sakhinetipalli	2.54	2.0			
Rajmundry rural	0.48	2.0			
Average	2. 53	7.18	Average	1. 64	7. 62



Heaped harvested nuts



Mite infestation on tender coconuts

An Integrated Pest Management (IPM) strategy blending plant protection and nutritional care is recommended for management of coconut eriophyid mite in these regions.

Summary

In Andhra Pradesh, eriophyid mite incidence was first reported on coconut from Chittoor area of the State during 1999 and infestation is prevailing in the state in varying intensities for the last 12 years due to the congenial weather factors favouring the buildup of the pest population. In the present investigation, mite incidence was recorded from two districts viz., East and West Godavari districts, which constitute the major share of coconut area (68%) and production (71%) of the State. The data collected revealed a low to medium level of mite incidence in both these districts as more than 95% of the infested nuts falling either under less than 25% of nut surface damage or 25-50% damage symptoms on nuts. In general East Godavari District recorded higher levels of mite incidence, infestation

level on nuts and population of mite in sample nuts when compared to West Godavari District. Variety wise mite incidence in the districts revealed highest incidence in local variety, East Coast Tall (ECT) and lowest in Malayan Green Dwarf (MGD). There was no significant difference in mite incidence in gardens with multicropping when compared to monocropping gardens. Among the coconut gardens having multiple cropping, mite incidence was lowest in gardens with ornamental plants as component crop. The sample nuts collected from these districts revealed the presence of predatory mite *Neoseiulus baraki* in 72% of samples suggesting buildup of this bioagent in these areas. However, the potential biocontrol agent of this mite *Hirsutella thompsonii* was not recorded probably due to higher temperature prevailing in these zones. The local variety, East Coast Tall cultivated extensively in these two districts is characterized with heavy bearing of small to medium sized nuts offering a conducive microclimate for the population build up of eriophyid mite. Nuts are oblong in shape and as such the tepals are not tightly packed giving room for mite entry during the developing stages of the nuts. The congenial weather conditions favouring the buildup of the pest are existing

Table - 10. Percentage of eriophyid mite incidence in different cropping systems

	Cropping system	
	Mono cropping	Multi cropping
Percentage of mite infestation (Sample mean)	33.0304	30.2157
Sample size	47	82
Standard Deviation	23.8731	24.3915
Calculated t value	0.6356	
	NS	

Table- 11. Influence of inter/mixed crops on eriophyid mite incidence

Inter/mixed crops with coconut	Mite incidence	
	Original	Transformed
Cocoa	31.588	33.596
Banana	37.016	36.773
Arecanut	47.434	44.192
Ornamental plants	19.300	24.239
SE/plot	15.69	
Gen. Mean	32.24	
CD (p=0.05)	12.15	



Coconut garden with cocoa intercrop



Coconut garden with banana intercrop

in these two districts. High temperature attaining more than 35°C during summer months as well as low distribution of rainfall (<1100 mm) is favouring the mite build up in these tracts. It is observed that well maintained coconut gardens with proper irrigation and nutritional care exhibited a marked reduction in mite incidence when compared to neglected gardens.

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