



Plant Archives

Journal homepage: <http://www.plantarchives.org>

DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.2.136>

STATUS OF PESTS OF COCONUT PALMS IN MAHARASHTRA STATE OF INDIA

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(Date of Receiving-04-07-2025; Date of Acceptance-17-09-2025)

ABSTRACT

Roving survey carried out during 2023-24 in Palghar, Raigad, Sindhudurg, Ratnagiri, Satara and Kolhapur districts in Maharashtra State has revealed the extent of damage in terms of incidence and intensity for major pests of coconut. The maximum incidence of rhinoceros beetle (RB) was in Sindhudurg district (16.8%) and minimum incidence was in (5.60%) Satara district. The red palm weevil (RPW) infestation was below Economic Threshold Level (ETL) in all the districts. The observations on occurrence of coconut black headed caterpillar (BHC) in Raigad, Kolhapur, Satara and Palghar districts showed 2.0, 1.0, 0.80 and 0.36 per cent infestation, respectively. The highest nut damage by eriophyid mite infestation was recorded in Kolhapur district (37.9%) with a mean grade index (MGI) of 0.67. The MGI was lesser in all the other districts. The least nuts damage (11.9%) was observed in Palghar district. The invasive whitefly (WF) infestation was noticed very less as compared to the previous year. Maximum incidence (14.2%) and intensity (10.4) of WF was noticed in Sindhudurg and Palghar districts, respectively. Whereas minimum was observed in Raigad (5.1 and 6.0%, respectively). The infestation of RB, BHC and eriophyid mite were observed with increasing temperature.

Key Words: Black headed caterpillar, coconut, eriophyid mite, exotic whiteflies, palms, red palm weevil, rhinoceros beetle, survey,

Introduction

Coconut is the most versatile tree crop cultivated in the tropics providing livelihood and employment securities to the rural agrarian mass in the region. It is an important plantation crop which is mainly cultivated by farmers of southern state and states like Goa, Maharashtra, Gujarat, West Bengal, Odisha, Asam, Andaman and Nicobar Islands, Lakshadweep and Minicoy islands are also having considerable area under coconut. The low size of the land holding by coconut growers is a serious challenge to both profitability and sustainability of the crop. It is essentially a crop of marginal and small farmers in India. The coconut palm is attacked by a variety of pests. The majority attack the leaves and spindle. Leaf damage due to rhinoceros beetles ranged from 12.5 to 35.5 and spindle damage ranged from 33.3 per cent to 45 per cent by Chalapathi *et al.*, (2018), while others attack the trunks (stems), Mathen (1962) reported that the red palm weevil,

Rhynchophorus ferrugineus Oliv, (RPW) (curculionidae, Coleoptera) is a serious pest attacking different species of palm trees (e.g. date palm, coconut palm, and royal palm). Some are major pests which cause considerable damage and yield loss, while some are less damaging. Most of these insects remain as minor pests, either because the environmental conditions are not favorable for their rapid multiplication, or because they are adequately controlled by natural enemies. The rhinoceros beetle, red palm weevil, black headed caterpillar and eriophyid mite were the major pests in Konkan region of Maharashtra. *Aceria guerreronis* is a serious pest in many coconut growing areas in India. This mite species was first described in 1965 from a specimen of Guerrero State, Mexico (Kurien *et al.*, 1979). The rapid outbreak of this pest in coconut plantations endangered the copra industry in India, reducing coconut yields and economic profits. Rugose spiraling whitefly

(RSW) *Aleurodicus rugioperculatus* (Hemiptera: Aleurodidae) is an invasive pest causing severe damage to coconut plant, having higher percent of infestation (70.2% to 165.4%). The nymph and adults suck cell sap from the underside of the leaves and secrete honeydew that develop sooty mold fungi and interfere the growth of the plants (Moon and Amin 2023). By considering economic importance of pest and yield loss of palm, the present investigation was carried out for assessment of major pests during roving survey were undertaken to know the exact status of coconut pests in Konkan region of Maharashtra State.

Material and Methods

The roving survey were taken at Palghar, Raigad, Sindhudurg, Ratnagiri, Satara, and Kolhapur districts of Maharashtra State during October – November 2023 and the extent of damage in terms of incidence and intensity were recorded for major pests of coconut. Survey was undertaken in major coconut growing tracts. Five block/villages in a district, 5 gardens in each block/village and 25 palms in each garden were consider for recording observations. The rhinoceros beetle, red palm weevil, black headed caterpillar, eriophyid mite and invasive whitefly of coconut were recorded by using following methods

1. Rhinoceros beetle: Per cent of palm infested (Out of 100 palms/garden)- The top 10 fronds in each palm with single/ multiple cuts was observed. Per cent leaf damage (25 palms at random/garden) (infested/total number of leaves $\times$ 100),
2. Eriophyid mite: Per cent nut infested (Mite infested nuts/total nuts) (25 palms at random/garden). Damage grade (mature bunch) (intensity 0-4 scale) (out of minimum 100 nuts/garden) using CPCRI scales were followed.

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

3. Red palm weevil: Per cent of palms infested (out of total palm (>100)/garden with typical symptom of RPW.
4. Black headed caterpillar: Per cent leaf damage (infested leaf/total leaf) (50 palms/ garden).



5. Invasive whitefly: Incidence - Per cent of leaves infested /palms (no. of leaves infested by WF/ total leaf per palm $\times$ 100). Intensity- Total no. of leaflets infested by WF/total leaflets per leaf) were used.

Results and Discussion

Roving survey was carried out during October - November 2023 in Ratnagiri, Sindhudurg, Raigad, Palghar, Satara and Kolhapur districts of Maharashtra State and the extent of damage in terms of incidence and intensity were recorded for major pests of coconut during surveys. The data presented in Table 1 to 6 indicated talukas wise pest infestation on coconut crop and data depicted in Table 7 revealed that the average per cent infestation of coconut rhinoceros beetle (RB) was noticed in all age palm groups which ranges between 5.60 to 16.8 per cent. The maximum incidence of RB was observed in Sindhudurg district (16.8%). Wankhede *et al.*, (2019) found that the maximum incidence of 21.3 percent was noticed in Sindhudurg district. Whereas minimum incidence of RB

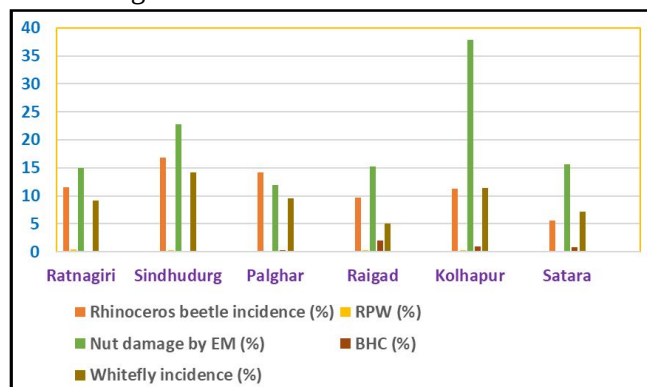


Fig. 1: Average per cent infestation of pests infesting coconut during 2023-24.

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Block	RBI	RBLD	RBSD	NDEM	MGI	RPW (%)	BHC (%)	BHC larva	WI	WFI
Devgad	16.6	7.0	3.2	20.0	0.28	0.10	0.0	0.0	20.1	9.0
Malwan	25.4	6.9	4.0	14.3	0.19	0.00	0.0	0.0	15.1	7.2
Kudal	11.8	7.6	4.8	16.9	0.23	0.43	0.0	0.0	12.1	5.1
Vengurla	18.1	7.4	0.8	32.6	0.47	0.65	0.0	0.0	4.34	2.4
Sawantwadi	12.0	6.6	0.8	30.3	0.44	0.00	0.0	0.0	19.2	10.9
Mean ± SE	16.8 ±	7.1 ±	2.7 ±	22.8 ±	0.33 ±	0.24 ±	0.0 ±	0.0 ±	14.2 ±	6.9 ±
	2.79	0.21	0.92	4.0	0.06	0.15	0.0	0.0	3.2	1.6
RBI: Rhinoceros beetle incidence (%); RBLD: RB Leaf damage (%); RBSD: RB Spindle damage (%); NDEM: Nut damage by EM (%); WI: Whitefly incidence (%); WFI: White fly intensity (%)										

[illegible]

Block	RBI	RBLD	RBSD	NDEM	MGI	RPW (%)	BHC (%)	BHC larva	WI	WFI
Roha	8.79	3.2	2.4	16.5	0.18	0.43	6.0.	2.4	7.56	10.0
Alibaug	9.98	4.0	3.2	19.9	0.26	0.21	1.6	0.8	12.6	15.4
Pen	10.5	3.0	1.6	14.7	0.19	0.27	2.4	1.2	5.26	4.81
Karjat	10.1	4.7	3.2	8.48	0.10	0.16	0.0	0.0	0.0	0.0
Sudhagad	9.3	1.9	0.8	17.0	0.17	0.66	0.0	0.0	0.0	0.0
Mean ± SE	9.7 ±	3.3 ±	2.24 ±	15.3 ±	0.18 ±	0.35 ±	2.0 ±	0.88 ±	5.1 ±	6.0 ±
	0.3	0.5	0.52	2.1	0.03	0.10	1.23	0.50	2.6	3.3
RBI: Rhinoceros beetle incidence (%); RBLD: RB Leaf damage (%); RBSD: RB Spindle damage (%); NDEM: Nut damage by EM (%); WI: Whitefly incidence (%); WFI: White fly intensity (%)										

Table 5: Average per cent infestation of pests infesting coconut during roving survey in Kolhapur district of Western Maharashtra during 2023.

Block	RBI	RBLD	RBSD	NDEM	MGI	RPW (%)	BHC (%)	BHC larva	WI	WFI
Chandgad	10.5	3.3	2.0	21.2	0.34	0.0	0.0	0.0	12.7	7.7
Kagal	10.5	2.7	0.0	51.0	0.87	0.0	4.0	2.0	8.87	4.0
Panhala	13.3	3.4	3.0	34.8	0.57	0.7	0.0	0.0	12.6	5.9
Shahuwadi	11.0	3.3	3.0	44.6	0.87	0.2	0.0	0.0	11.4	6.6
Mean $\pm$ SE	11.3 $\pm$ 0.7	3.1 $\pm$ 0.1	2.0 $\pm$ 0.8	37.9 $\pm$ 7.4	0.67 $\pm$ 0.15	0.24 $\pm$ 0.19	1.0 $\pm$ 1.1	0.5 $\pm$ 0.5	11.4 $\pm$ 1.0	6.1 $\pm$ 0.9
RBI: Rhinoceros beetle incidence (%); RBLD: RB Leaf damage (%); RBSD: RB Spindle damage (%); NDEM: Nut damage by EM (%); WI: Whitefly incidence (%); WFI: White fly intensity (%)										

Table 6: Average per cent infestation of pests infesting coconut during roving survey in Satara district of Western Maharashtra during 2023.

Block	RBI	RBLD	RBSD	NDEM	MGI	RPW (%)	BHC (%)	BHC larva	WI	WFI
Karad	6.52	1.76	0.00	14.4	0.22	0.40	1.2	0.2	8.8	7.6
Satara	4.53	2.24	0.80	14.6	0.23	0.01	1.2	0.4	5.1	4.5
Koregaon	5.74	2.48	1.60	18.2	0.27	0.19	0.0	0.0	7.9	5.9
Mean $\pm$ SE	5.60 $\pm$ 0.71	2.16 $\pm$ 0.26	0.80 $\pm$ 0.57	15.7 $\pm$ 1.5	0.24 $\pm$ 0.02	0.20 $\pm$ 0.14	0.80 $\pm$ 0.4	0.20 $\pm$ 0.1	7.2 $\pm$ 1.3	6.0 $\pm$ 1.0
RBI: Rhinoceros beetle incidence (%); RBLD: RB Leaf damage (%); RBSD: RB Spindle damage (%); NDEM: Nut damage by EM (%); WI: Whitefly incidence (%); WFI: White fly intensity (%)										

Table 7: Average per cent infestation of pests infesting coconut during roving survey in Maharashtra during Oct.-Nov. 2023.

Block	RBI	RBLD	RBSD	NDEM	MGI	RPW (%)	BHC (%)	BHC larva	WI	WFI
Ratnagiri	11.6 $\pm$ 1.4	3.97 $\pm$ 0.6	1.60 $\pm$ 0.8	0.37 $\pm$ 0.12	15.0 $\pm$ 1.0	0.21 $\pm$ 0.02	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	9.2 $\pm$ 2.9	5.5 $\pm$ 0.7
Sindhudurg	16.8 $\pm$ 2.7	7.1 $\pm$ 0.2	2.7 $\pm$ 0.9	0.24 $\pm$ 0.15	22.8 $\pm$ 4.0	0.33 $\pm$ 0.06	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	14.2 $\pm$ 3.2	6.9 $\pm$ 1.6
Palghar	14.2 $\pm$ 1.3	4.41 $\pm$ 1.0	2.04 $\pm$ 1.0	0.12 $\pm$ 0.08	11.9 $\pm$ 0.5	0.19 $\pm$ 0.02	0.36 $\pm$ 0.2	0.18 $\pm$ 0.1	9.6 $\pm$ 1.7	10.4 $\pm$ 1.9
Raigad	9.7 $\pm$ 0.3	3.3 $\pm$ 0.5	2.24 $\pm$ 0.5	0.35 $\pm$ 0.10	15.3 $\pm$ 2.1	0.18 $\pm$ 0.03	2.0 $\pm$ 1.23	0.88 $\pm$ 0.50	5.1 $\pm$ 2.6	6.0 $\pm$ 3.3
Kolhapur	11.3 $\pm$ 0.7	3.1 $\pm$ 0.1	2.0 $\pm$ 0.8	0.24 $\pm$ 0.19	37.9 $\pm$ 7.4	0.67 $\pm$ 0.15	1.0 $\pm$ 1.1	0.5 $\pm$ 0.5	11.4 $\pm$ 1.0	6.1 $\pm$ 0.9
Satara	5.60 $\pm$ 0.7	2.16 $\pm$ 0.2	0.80 $\pm$ 0.5	0.20 $\pm$ 0.14	15.7 $\pm$ 1.5	0.24 $\pm$ 0.02	0.80 $\pm$ 0.4	0.20 $\pm$ 0.1	7.2 $\pm$ 1.3	6.0 $\pm$ 1.0
Mean $\pm$ SE	11.56 $\pm$ 1.2	4.04 $\pm$ 0.5	1.90 $\pm$ 0.8	0.25 $\pm$ 0.1	19.8 $\pm$ 2.8	0.30 $\pm$ 0.0	0.69 $\pm$ 0.5	0.29 $\pm$ 0.2	9.4 $\pm$ 2.2	6.8 $\pm$ 1.6
RBI: Rhinoceros beetle incidence (%); RBLD: RB Leaf damage (%); RBSD: RB Spindle damage (%); NDEM: Nut damage by EM (%); WI: Whitefly incidence (%); WFI: White fly intensity (%)										

was recorded (5.60%) in Satara district. Chalapathi Rao *et al.*, 2018 found that the per cent of leaf damage due to rhinoceros beetles ranged from 12.5 to 35.5 and spindle damage ranged from 33.3 per cent to 45 per cent. The highest leaf (7.1%) and spindle damage (2.7%) was observed in Sindhudurg. However, least leaf and spindle damage were observed in Satara district (2.16 and 0.80%, respectively).

The red palm weevil (RPW) infestation was noticed below ETL in all districts. The maximum infestation of

RPW (0.37%) was recorded in Ratnagiri district. Whereas minimum incidence was noticed in Palghar (0.12%) in Satara district. Mathen, 1962 reported that the red palm weevil, *Rhynchophorus ferrugineus* Oliv, (RPW) (curculionidae, Coleoptera) is a serious pest attacking different species of palm trees (*e.g.* date palm, coconut palm, and royal palm),

The infestation of coconut black headed caterpillar (CBHC) was observed in Raigad, Kolhapur, Satara and Palghar districts which recorded 2.0, 1.0, 0.80 and 0.36

per cent, respectively. However, average incidence of CBHC was observed to be 0.69 per cent in Maharashtra State. Gurav *et al.*, 2018 observed that *Opisina arenosella* was observed in all talukas throughout the year in the range of 18.7 to 54.9 per cent in Navsari district. Pest incidence and pest intensity trend showed that peak incidence was recorded during summer months that from April to May while it decreases from September onwards and reaches to minimum in winter months November and December.

The nut damage by eriophyid mite was recorded in the range of 11.9 to 37.9 per cent. The highest nut damage due to eriophyid mite was noticed in Kolhapur district (37.9%) with a mean grade index (MGI) of 0.67. Similar results on eriophyid mite infestation were also noticed by Alagar *et al.*, 2019 and Levin and Mammooty, 2003 indicated that most of the infested nuts were in the damage category of two and three and the percentage of mite damage was only 25.4%. The MGI was noticed mildly in all the districts. Desai *et al.*, 2009 indicated that the eriophyid mite infestation was higher in Thane district followed by Sindhudurg district. The least nuts damage (11.9%) was observed in Palghar district.

The invasive whitefly (WF) infestation was noticed very less as compared to the previous year. The incidence and intensity of WF was observed in all the districts of Maharashtra which ranges between 5.1 to 14.2 and 6.0 to 10.4 per cent, respectively. Maximum incidence (14.2%) and intensity (10.4) of WF was noticed in Sindhudurg and Palghar districts, respectively. Wankhede *et al.*, (2021) found that the incidence and intensity of rugose spiralling whitefly had increased during rainy season which recorded 31.9 and 18.1 per cent. Whereas minimum was observed in Raigad (5.1 and 6.0%, respectively).

Present data correlated with Muyengi *et al.*, 2015 showed that about 46.7% of the farmers experienced the problem of rhinoceros beetle (*Oryctes monoceros*) in their farms and about 4.7% with coconut mites (*Aceria guerreronis*). Vanderplank (1959a), Bedford (1975), Paul (1985) and Seguni (2010) also indicated the same results. The mean incidence of rhinoceros beetle, red palm weevil, black headed caterpillar, nut damage by eriophyid mite, invasive whitefly incidence and intensity were recorded 11.5, 0.25, 0.69, 19.8, 9.4, and 6.8 per cent in Maharashtra State during 2023. The infestation of RB, BHC and eriophyid mite were observed with increasing temperature.

Conclusion

The mean incidence of rhinoceros beetle, red palm weevil, black headed caterpillar, nut damage by eriophyid mite, invasive whitefly incidence and intensity were recorded 11.5, 0.25, 0.69, 19.8, 9.4, and 6.8 per cent in Maharashtra State during 2023.

Acknowledgements

The authors are thankful to Dr.BSKKV, Dapoli and ICAR-AICRP (Palms) for providing funds, technical help and timely guidance for conduct of experiment.

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