



Diseases of Palmyrah in Andhra Pradesh - A preliminary report

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Palmyrah (*Borassus flabellifer* L.) is an important palm tree that contributes to the economic upliftment of Indian farmer. Palmyrah palm, adorns the dry landscape of the semi arid regions of Tamil Nadu, Andhra Pradesh, Orissa, West Bengal, Bihar, Karnataka and Maharashtra. India has nearly 121.5 million palms. Leaf blight caused by *Pestalotiopsis palmarum*, leaf spot caused by *Stigmina Palmivora* and bud rot caused by *Phytophthora palmivora* are the important diseases that pose serious constraints to the production and productivity of the palmyrah crop in India. Previously, the maximum leaf blight and leaf spot severity on palmyrah was reported in Nalgonda (46.67 %) and Kattangoor (45.83 %) mandals of Nalgonda district in Andhra Pradesh (Vijay Krishna Kumar *et al.*, 2006). Infection with the foliar diseases can severely reduce the photosynthetic ability of the trees and thus finally leading to decline in starch and cellulose contents (Karthikeyan and Bhaskaran, 1997). Adult palms of 20-40 years of age were found highly susceptible to the leaf blight disease of coconut (Karthikeyan and Baskaran, 1999). The leaf blight disease in coconut though never fatal but reduces the general vitality of the palms (Horne, 1908). Bud rot is another fatal disease of palmyrah and coconut palms, characterized by the rotting of the terminal bud and surrounding tissues. Even though it affects the palms of all ages, young palms in low lying and moist situations are more susceptible to the disease. The disease commonly occurs in West and East coasts of India (Menon and Pandalai 1958; Ohler, 1984; Srinivasan, 2001). The incidence of bud rot was recorded in coconut up to 21.3% in Andhra Pradesh, 7.0% in Karnataka, 2.0% in Tamil Nadu and 6.5% in Kerala (Srinivasulu *et al.*, 2006).

Vijaya Krishna Kumar *et al.* (2006) reported foliar and bud rot diseases on palmyrah in Nalgonda district of Andhra Pradesh. There is not much information available on the present status of the palmyrah diseases in Andhra Pradesh. Prior to taking up of any remedial measures

against these diseases, detailed knowledge on their prevalence in specific targeted localities is mandatory. Hence, the present investigation was undertaken in selected districts of Andhra Pradesh to elucidate the area wise severity of foliar diseases and bud rot incidence on palmyrah and finally to map the sensitive areas with respect to these diseases.

Survey was carried out in the selected mandals of Visakhapatnam, West Godavari, Srikakulam and East Godavari districts from 2006-2008. Roving survey was conducted along transect of potential mandals and the foliar and bud rot diseases were recorded area wise. The following is the scale adopted for recording the disease severity of the leaf spot and leaf blight diseases.

- 0: No visible symptoms
- 1: <1 % leaf area affected
- 3: 1-10 % leaf area affected
- 5: 11-25 % leaf area affected
- 7: 26-50 % leaf area affected
- 9: >51 % leaf area affected

Twenty leaves were randomly selected from each locality surveyed and data was recorded in terms of severity (% leaf area infected) by comparing with standard area diagram on 0-9 scale (Mayee and Datar, 1986) and adjoining crops.

Leaf blight and leaf spot severity was calculated by adopting the following formula.

$$\text{Severity} = \frac{\text{Sum of grades}}{\text{No. of leaves sampled} \times \text{Maximum grade}} \times 100$$

Bud rot incidence was recorded on the trees based on symptoms that were visible on the crown, leaf blades and also on the terminal bud. Disease attack was also noted taking into account the bare trunks that were already dead due to bud rot attack.

The mean leaf blight severity was found to be minimum in Nakkapalli (5.42 %) followed by Makavarapalem (5.55 %) and maximum in Payakaraopet (21.94 %) mandals (Table 1) among the 15 mandals surveyed during 2006. Three mandals *viz.*, Kotavuratla, S.Rayavaram and Buccyyapet mandals were found to be

Table 1. Incidence of palmyrah diseases in Visakhapatnam district of Andhra Pradesh during 2006

Sl. No.	Mandal	No. of Villages surveyed	Mean per cent disease severity/incidence		
			Leaf blight	Leaf spot	Bud rot
1.	Payakaraopet	4	21.94	28.47	--
2.	Kasimkota	5	8.44	5.44	3.51
3.	Makavarapalem	7	5.55	2.86	5.51
4.	Narsipatnam	6	23.24	6.85	5.86
5.	Kotavuratla	4	--	7.08	--
6.	S.Rayavaram	4	--	--	1.00
7.	Nakkapalli	4	5.42	7.78	1.21
8.	Yalamanchili	5	13.33	--	3.20
9.	Rambilli	6	6.20	11.67	1.33
10.	Achyutapuram	1	11.66	--	4.00
11.	Parawada	2	14.72	--	--
12.	Madugula	4	19.58	11.81	2.25
13.	Buchyyapet	1	--	--	14.29
14.	Chodavaram	2	16.11	16.94	--
15.	Anakapalle	2	20.28	8.59	0.68

free of leaf blight incidence as evident from its zero per cent severity. Data on leaf spot severity revealed that Makavarapalem recorded minimum severity (2.86 %) and Payaraopet recorded maximum severity (28.47 %). Five mandals *viz.*, S. Rayavaram, Yalamanchili, Achyutapuram, Parawada and Buchyyapet were found to be free of leaf spot incidence. Observations on bud rot incidence revealed that Anakapalle and Buchyyapet mandals recorded minimum (0.68 %) and maximum (14.29 %) incidence respectively, while four mandals *viz.*, Payakaraopet, Kotavuratla, Parawada and Chodavaram mandals were found to be free of bud rot incidence. The weather parameters recorded during survey period were maximum (33.7 °C), minimum (20.6 °C) temperature and maximum (91 %), minimum (59 %) relative humidity.

Data of survey carried out in 28 mandals of West Godavari district during 2007 (Table 2) revealed that the mean leaf blight severity was found to be minimum in Tadepalligudem and Kannapuram (0.83 %) and maximum in Vunguturu (9.99 %) mandals. Vundrajavaram mandal was found to be free of leaf blight incidence. Observations on leaf spot severity revealed that Pentapadu mandal recorded minimum severity (0.18 %) and Kamavarapukota recorded maximum

Table 2. Incidence of palmyrah diseases in West Godavari district during 2007

Sl. No.	Mandal	Soils	Adjoining crops	No. of villages surveyed	Mean per cent disease severity/ incidence		
					Leaf blight	Leaf spot	Bud rot
1.	Tadepalligudem	Red	Rice, Sugarcane	2	0.83	--	2.89
2.	Nallajerla	"	Rice, Sugarcane	5	4.22	2.11	0.44
3.	Koyyalagudem	Red/black	Rice, Sugarcane	3	5.36	--	4.76
4.	Kannapuram	Red	Rice	2	0.83	--	--
5.	Buttaigudem	Black	Rice, Cotton	2	1.94	--	--
6.	Jangareddigudem	Black	Rice, Sugarcane	2	4.72	--	--
7.	Devarapalli	Red	Rice	1	3.88	--	--
8.	Yerrannagudem	"	"	1	1.66	--	--
9.	Ganapavaram	"	"	1	1.11	--	8.77
10.	Poduru	"	"	1	5.55	5.00	--
11.	Narasapuram	"	"	2	1.39	--	--
12.	Mogalturu	"	"	2	6.11	--	--
13.	Bhimavaram	"	"	2	2.50	--	--
14.	Vundi	"	"	1	3.33	2.77	--
15.	Pentapadu	"	"	3	1.85	0.18	--
16.	Vunguturu	"	"	5	9.99	2.33	--
17.	Bhimadolu	"	"	3	7.59	--	--
18.	Kamavarapukota	"	"	4	6.66	7.36	--
19.	Chintalapudi	"	"	3	2.77	1.66	--
20.	Lingampalem	"	Cotton	1	1.11	6.66	--
21.	Dharmajigudem	"	Rice, Cotton, Chillies	1	1.66	--	--
22.	Pedavegi	"	Rice, Coconut	2	3.89	6.39	--
23.	Eluru	"	Rice	1	6.11	--	--
24.	Vundrajavaram	"	Rice	2	--	1.67	1.33
25.	Nidadavolu	"	Rice	5	1.67	--	--
26.	Chagallu	"	Rice, Sugarcane	3	2.41	1.39	--
27.	Tallapudi	"	Rice, Sugarcane	5	6.44	--	--
28.	Gopalapuram	"	Rice	3	2.22	--	--

severity (7.36 %). However, 17 mandals were found to be free of leaf spot incidence. Similarly, data recorded on bud rot incidence indicated that Nallajerla mandal recorded minimum incidence (0.44 %) and Ganapavaram mandal recorded maximum (8.77 %) incidence, whereas 23 mandals were found to be free of bud rot incidence. The maximum (28.9 °C), minimum (23.8 °C) temperature; maximum (90.1 %), minimum (73.0 %) relative humidity was recorded during survey period.

Survey undertaken in 26 selected mandals of Srikakulam district during 2008 (Table 3) indicated that the mean leaf blight severity was found to be minimum in Palakonda (0.28 %) and maximum at Kanchili (8.61 %) mandals, while three mandals *viz.*, Nandigam, Tekkali and Pathapatnam mandals were found to be free of leaf blight incidence. Data on leaf spot severity indicated that Hiramandalam and Kanchili mandals recorded minimum (0.55 %) and maximum severity (4.99 %), respectively, while eight mandals were found to be free of leaf spot incidence. Observations on bud rot incidence revealed that Srikakulam and Ponduru mandals recorded minimum (0.41 %) and maximum (0.78 %) incidence, respectively indicating low incidence of bud rot. The maximum and minimum temperatures recorded during survey period were 30.2 and 17.7 °C, respectively.

Results of survey carried out in 28 mandals of East Godavari district during 2008 (Table 4) revealed that the mean leaf blight severity was found to be minimum in Samalkot and Ambajipeta (1.11 %) and maximum in Tuni (24.26 %) mandals. Leaf spot severity was found to be minimum in Rajole (0.37 %) and maximum in Tuni (20.37 %) mandals, respectively, while five mandals were found to be free of leaf spot disease. Data recorded on bud rot incidence revealed that Addateegala mandal recorded minimum (0.07 %) and Karapa mandal recorded maximum (2.81 %) incidence. The maximum and minimum temperatures, maximum and minimum relative humidity recorded during survey period were 34.1 °C and 23.9 °C and 95 and 45 %, respectively.

Critical observations from Table 5 revealed that out of the 97 mandals surveyed in four districts, less than 5 % of leaf blight severity was recorded in 54 mandals, 5-20 % in 32 mandals and >20 % severity in four mandals, while seven mandals were found to be free of leaf blight disease. Leaf spot severity was less than 5 % in 47 mandals, 5-20 % in 13 mandals and >20 % severity in 2 mandals, whereas 35 mandals were found to be free of leaf spot disease. Similarly, bud rot incidence was less than 5 % in 29 mandals, 5-20 % in 4 mandals and 64 mandals were free of bud rot incidence indicating the

Table 3. Incidence of palmyrah diseases in Srikakulam district during 2008

Sl. No.	Mandal	Soils	Adjoining crops	No. of villages surveyed	Mean per cent disease incidence/severity		
					Leaf blight	Leaf spot	Bud rot
1.	Amudalavalasa	Red	Rice, Eukalyptus	6	4.81	1.94	--
2.	Boorja	Red	Rice, Mango, Eukalyptus	6	3.52	1.39	--
3.	Palakonda	Red	Rice	4	0.28	--	--
4.	Veeragattam	Red	Rice	7	2.62	0.63	--
5.	Regidi	Red	Rice, Sugarcane, Coconut	3	3.88	2.40	--
6.	Rajam	Red	Rice, Mango	3	4.26	0.74	--
7.	Ponduru	Red	Rice, Coconut, Mango	5	3.33	1.33	0.78
8.	Srikakulam	"	Rice, Sunflower	3	1.66	--	0.41
9.	Gara	"	Sunflower	4	2.64	0.69	--
10.	Kanchili	"	Coconut, Cashew	2	8.61	4.99	--
11.	Kaviti	"	Coconut, Cashew	3	4.44	2.03	--
12.	Sompeta	Red/ Black	Coconut, Groundnut, Pulses, Sunflower	5	3.11	--	--
13.	Mandasa	Red	Rice, Blackgram, Groundnut, Sunflower	3	1.85	--	--
14.	Palasa	"	Rice, Blackgram, Groundnut	3	0.92	--	--
15.	Nandigam	"	Rice, Coconut	1	--	--	--
16.	Tekkali	"	Rice, Sunflower	1	--	--	--
17.	Santhabommali	"	Rice, Coconut	3	3.52	2.04	--
18.	Kotabommali	"	Rice, Mango	4	4.44	1.94	--
19.	Narsannapeta	"	Rice, Sugarcane, Groundnut, Sunflower	4	3.32	0.83	--
20.	Pathapatnam	"	Coconut, Groundnut	1	--	--	--
21.	Saravakota	"	Rice, Coconut, Sunflower	2	4.72	4.44	--
22.	Hiramandalam	"	Rice, Blackgram, Coconut	3	2.59	0.55	--
23.	Bhamini	"	Rice, Sunflower, Mango	4	3.05	1.11	--
24.	Kottur	"	Rice, Mango, Cashew	2	3.89	0.83	--
25.	L.N. Peta	"	Rice	2	6.39	2.49	--
26.	Saribujjili	"	Rice	2	7.49	3.32	--

Table 4. Incidence of palmyrah diseases in East Godavari district during 2008

Sl. No.	Mandal	Soils	Adjoining crops	No. of villages surveyed	Mean per cent disease severity/ incidence		
					Leaf blight	Leaf spot	Bud rot
1.	Rajahmundry	Black	Rice, Coconut	3	4.25	--	0.72
2.	Mandapeta	Black	Rice	2	1.39	0.83	--
3.	Rayavaram	Black	"	2	4.72	--	--
4.	Ramachandrapuram	"	"	1	2.22	--	--
5.	Draksharama	"	Rice	2	8.33	3.89	2.61
6.	Karapa	"	"	3	8.14	2.96	2.81
7.	Kajuluru	"	"	2	3.05	2.50	--
8.	Pitapuram	"	"	3	3.52	2.96	0.64
9.	Tuni	"	"	4	24.26	20.37	0.73
10.	Samalkot	"	"	1	1.11	--	--
11.	Peddapuram	"	"	1	2.77	--	--
12.	Rangampeta	"	"	2	2.22	1.39	--
13.	Rajanagaram	"	"	5	7.22	2.66	0.25
14.	Atreyapuram	"	Coconut + Banana, Rice	8	5.62	2.50	--
15.	Ravulapalem	"	Rice, Coconut+ Banana	5	6.44	2.11	0.22
16.	P. Gannavaram	"	Coconut+ Banana	5	3.33	0.78	0.50
17.	Rajole	"	Coconut	3	2.22	0.37	--
18.	Malkipuram	"	Coconut	2	3.89	0.56	--
19.	Ambajipeta	"	Coconut	2	1.11	0.55	--
20.	Kothapeta	"	Coconut	2	4.99	0.83	--
21.	Alamuru	"	Rice	3	7.03	3.33	1.86
22.	Kadium	"	"	2	4.72	1.39	1.18
23.	Rampachodavaram	Red	Cashew	7	6.66	3.57	0.25
24.	Devipatnam	"	Cashew	6	6.66	5.83	0.15
25.	Gangavaram	"	Rice, Cashew	3	9.99	2.40	1.11
26.	Addateegala	Red	Rice, Cashew	8	5.06	3.12	0.07
27.	Y.Ramavaram	Red	Bunds, Rice, Cashew	4	5.55	2.49	0.71
28.	Rajavommangi	Red	Rice	3	8.70	4.44	--

fact that the incidence of bud rot was below 20 % in four districts surveyed.

The findings on the palmyrah diseases from Table 1 to 4 indicated that out of four districts surveyed, leaf blight severity was found to be minimum in Palakonda (0.28 %) of Srikakulam district and maximum (24.26 %) in Tuni of East Godavari district. Leaf spot severity was found to be minimum in Pentapadu (0.18 %) of West Godavari district and maximum in Payakaraopet (28.47 %) of Visakhapatnam district. Results are in accordance with the findings of Vijay Krishna Kumar *et al.* (2006).

The variation in severity levels for the foliar diseases can be attributed to the facts that leaf spot is

problematic in the initial stages of palm life. Karthikeyan and Bhaskaran (1999) while working on incidence of leaf blight disease in relation to age, vigour and yield of coconut observed that leaf blight induced by *Pestalotiopsis palmarum* though found in seedlings and in adult palms, adult palms were found to be more susceptible and concluded that trees of 20 to 40 years were highly susceptible to the disease. They also reported that younger leaves of coconut that have shown increased resistance to leaf blight contained a lower quantity of nitrogen and a higher quantity of potassium than the older leaves. *In vitro* studies carried out by them substantiated the results in the way that the growth and sporulation of the test fungus, *Pestalotiopsis palmarum* was enhanced with nitrogenous compounds (Karthikeyan and

Table 5. Incidence of palmyrah diseases in four districts of Andhra Pradesh

Severity /Incidence	Leaf blight					Leaf spot					Bud rot				
	Visakha- patnam	West Godavari	Srika- kulam	East Godavari	Total	Visakha- patnam	West Godavari	Srika- kulam	East Godavari	Total	Visakha- patnam	West Godavari	Srika- kulam	East Godavari	Total
0	3	1	3	-	7	5	17	8	5	35	4	23	24	13	64
<5 %	-	19	20	15	54	1	7	18	21	47	8	4	2	15	29
5-<20 %	9	8	3	12	32	8	4	-	1	13	3	1	-	-	4
>20 %	3	-	-	1	4	1	-	-	1	2	-	-	-	-	-
Total	15	28	26	28	97	15	28	26	28	97	15	28	26	28	97

Bhaskaran, 1998). Moreover, leaf spot can be severe on tender seedlings.

Of all the mandals surveyed, bud rot incidence was found to be minimum in Addateegala (0.07 %) mandal of East Godavari district and maximum in Buchyyapet (14.29 %) in Visakhapatnam district. The results are in accordance with the findings of Srinivasulu *et al.* (2006) who reported the incidence of bud rot in coconut upto 21.3 % in Andhra Pradesh.

The study clearly displayed a fairly higher disease incidence irrespective of places either of districts under study. So much severity can aid in opining it as a serious setback in growth and yield parameters. This information suggests that, there is a need for survey on extensive areas in other states too.

References

- Horne, W.T. 1908. The bud rot and some other coconut troubles in Cuba. Bull 15, *Estacion Central Agronomica de Cuba*.
- Karthikeyan, A. and Bhaskaran, R. 1997. Post infectional changes in photosynthetic pigments, phenolics and carbohydrates in coconut leaves infected with leaf blight. *Madras Agricultural Journal* **84**: 707-709.
- Karthikeyan, A. and Bhaskaran, R. 1998. Mineral contents in coconut leaves resistant and susceptible to leaf blight infection caused by *Pestalotiopsis palmarum*. *Madras Agricultural Journal* **85**: 179-181.
- Karthikeyan, A. and Bhaskaran, R. 1999. Incidence of leaf blight disease in relation to age, vigour of coconut seedlings and yield of palms. *Madras Agricultural Journal* **86**: 80-82.
- Mayee, C.D. and Datar, V.V. 1986. Phytopathometry. Tech.Bull.-1. Maratwada Agricultural University, Parbhani, pp 218.
- Menon, K.P.V. and Pandalai, K.M. 1958. The coconut palm - A monograph. *Indian Central Coconut Committee, Ernakulam*, pp384.
- Ohler, J.G. 1984. Coconut Tree of Life FAO, Rome pp 446.
- Srinivasan, N. 2001. Diseases and disorders of coconut and their management In: *Plant Pathology* (Ed: Trivedi, P.C), Pointer Publishers, Jaipur, India, *Plant Path.* 194-205.
- Srinivasulu, B., Vijay Krishna Kumar, K., Aruna, K., Lakshmi, M.V. and Rao, D.V.R. 2006. A novel approach in the management of stem bleeding disease of coconut. 93rd Indian Science Congress at ANGRAU, Hyderabad. 3-7 January, 2006.
- Vijay Krishna Kumar, K., Srinivasulu, B., Venkata Ramana, K.T. 2006. Prevalence of palmyrah (*Borassus flabellifer* L.) diseases in High Altitude Zone of Andhra Pradesh. *Journal of Plant Protection Environment* **3**: 110-14.

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