

# A new lethal disease of coconut with unknown etiology in Tamil Nadu

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## Introduction

Coconut (*Cocos nucifera* L.), is grown in more than 90 countries around the world, mostly in coastal tropical areas, by the estimated 11 million farmers across 12 million hectares with over 80% of production in Asia. Coconut provides a staple food and serves as a cash crop in many developing countries; copra being one of the few sources of cash income for many households. In India, coconut is cultivated mainly in the coastal tracts of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Odisha, West Bengal, Pondicherry, and Maharashtra and in the islands of Lakshadweep, Andaman and Nicobar.

Coconut palm is affected by many lethal and debilitating diseases viz., basal stem rot (BSR) (*Ganoderma* spp.), bud rot (*Phytophthora palmivora*), stem bleeding (*Thielaviopsis paradoxa*), leaf blight (*Lasiodiplodia theobromae*), grey leaf spot (*Pestalotiopsis palmnarum*) and root wilt (*Phytoplasma*). Basal stem rot or Thanjavur wilt is the major lethal disease of coconut and it is distributed in all the major coconut growing areas of Tamil Nadu. During 2007, Bhaskaran and his co-workers

at Coconut Research Station, Veppankulam have reported a new lethal disease of coconut in Thanjavur district (Bhaskaran *et al.*, 2007). The first prominent symptom of new disease was the abnormal shedding of all buttons and nuts of all stages of the tree within a period of 3-5 days. The symptom is followed by yellowing and browning of lower whorl of leaves and spreads to upper whorl of leaves. These leaves also droop and fall off. Another characteristic symptom of the disease is the necrosis and rotting of spindle leaves, tip of the spadix and the whole unopened inflorescence. There is no bleeding patch on the stem and there is no rotting or discolorations in internal tissue of the affected stem. Infected palms usually die within 3 to 5 months after the first appearance of symptoms.

During 2016-17, a survey was conducted after the report of the disease by farmers of different villages of three districts in Tamil Nadu viz., Thanjavur, Thiruvavur and Pudukkottai to assess the incidence of new lethal (like) disease, which was reported by the farmers of three districts with unknown etiology. The survey results are presented in Table 1.



(Fig. 1).

Table 1. Incidence (%) of new disease in Tamil Nadu during 2016-17

S. No.	District/ Taluk	Village	Soil type	Variety/ Hybrid	Age of palm	Total No. of Palms observed	No. of infected Palms	Per cent infection (%)
<b>A. Thanjavur</b>								
1.	Pattukkottai	Veppankulam	Sandy loam	Hybrid (T x D)	9	75	1	1.33
		Vattakudi	sandy loam	ECT	25	225	2	0.8
		Moothakkuruchi	Sandy clay loam	ECT	25	225	2	0.8
		Silambavelenkadu	Sandy loam	ECT	15	150	1	0.6
		Athivetti	Sandy loam	ECT	20	75	1	1.33
		Madukkur	Sandy loam	ECT	13	475	5	1.33
		Nadankad	Sandy loam	ECT	35	75	1	1.33
		Punal vasal	Sandy loam	ECT	25	300	7	2.33
		Alathur	Red sandy loam	Hybrid (T x D)	15	475	5	1.33
		Thittakudi	Sandy loam	Hybrid (T x D)	12	300	3	1.33
		Kasankadu	Sandy loam	ECT	35	150	1	0.6
		Kalathur	Red sandy loam	ECT	22	150	2	1.33
2.	Orathanad	Thondrampattu	Sandy loam	ECT	25	225	6	2.66
		Ambalapattu	Sandy loam	ECT	18	150	2	1.33
		Thirmangalakottai west	Sandy loam	ECT	12	376	6	1.59
		Kothaiyakad	Sandy loam	ECT	22	225	7	3.11
		Thirumangalakottai keelaiyur	Sandy loam	ECT	30	150	1	0.66
		Ooranipuram	Red sandy loam	ECT	8	525	7	1.33
		Kakkarai	Sandy clay loam	ECT	22	1500	4	0.26
3.	Peravurani	Kallankadu	Sandy clay loam	ECT	22	675	5	0.74
		Kallooranikadu	Red sandy loam	ECT	18	975	6	0.62
Total						7476	75	1.00
<b>B. Thiruvarur</b>								
1.	Mannargudi	Ullikkottai	Sandy clay loam	ECT	15	225	9	4.00
		Mankottai natham	Sandy loam	ECT	22	2250	67	2.97
		Paravakkottai	Sandy loam	ECT		185	6	3.24
		Palayakkottai	Sandy loam	ECT	25	225	3	1.33
Total						2885	85	2.94
<b>C. Pudukkottai</b>								
1.	Aranthangi	Poovai managar	Red sandy loam	ECT	32	225	5	2.22
		Periyalur	Red sandy loam	ECT	25	450	10	2.22
		Avanathankottai	Red sandy loam	ECT	9	1350	12	0.88
2.	Alangudi	Vadakadu	Red sandy loam	ECT	10	225	2	0.88
		Avanam	Red sandy loam	ECT		12	600	2
Total						2850	31	
Grand Total						13211	191	

Out of 13,211 palms inspected in the three districts, 191 palms were infected by the new disease. Of which 75, 85 and 31 palms were infected at Thanjavur, Thiruvarur and Pudukkottai districts respectively. Maximum incidence of new disease with unknown etiology was recorded (2.94%) at Mannargudi taluk of Thiruvarur district and the per cent disease incidence ranged from 0.6 to 4.0 per cent.

During 2016-17, 75 farmers from various villages have reported the same type of symptoms as observed by Bhaskaran et al. (2007) in East Coast Tall variety and T x D hybrids in the age group of 8 to 35 years growing in various types of soil viz., sandy loam, sandy clay loam and red sandy loam from the villages of Thanjavur, Thiruvarur and Pudukkottai districts of Tamil Nadu. Only one or two trees in the entire coconut garden and in some gardens nearly 5-12 palms were affected by this disease which is increasing rapidly. In Mankottainatham village, Mannargudi Taluk, Thiruvarur district, Mr.S.Ganasekaran is having 2250 coconut palms aged about 20 years. He reported this wilt symptom in 20 coconut palms during February, 2017 and suddenly it rose to 67 palms within a period of 3 months.

**Symptoms**

The symptom of unknown disease in coconut palms consist of essentially four stages

**First stage: Shedding of nuts (Nut or fruit fall)**

In adult coconut palms, the first prominent visual symptom of the disease is the abnormal shedding of all buttons and both unmaturred and matured nuts within a period of 3-5 days (Fig. 1). Aborted nuts often develop a brown-black calyx-end rot reducing seed viability. But in immature palms or non-fruit bearing palms the first symptom is foliar discoloration (Fig. 2).



(Fig. 2).

**Second stage: Necrosis of inflorescence**

Inflorescence-necrosis is the next symptom which is readily observed as newly mature inflorescences (unopened) emerge from the unsheathing spathe wherein, male flowers abscise and no fruit is set (Fig. 3).



(Fig. 3).

**Third stage: Yellowing of leaves**

Yellowing of the leaves usually starts once necrosis is developed on two or more inflorescences and discoloration is more rapid than that associated with normal leaf senescence, starting with the older (lowermost) leaves, yellowing progresses upward to the entire crown (Fig. 4). Another characteristic of the symptom is necrosis and rotting of spear leaves at crown region (Fig. 5).



(Fig. 4).



(Fig. 5).



(Fig. 6).

#### Fourth stage: Complete defoliation

Typically, yellowed leaves remain turgid, but eventually turn brown, desiccate and hang down to form a skirt around the trunk for several weeks before falling. As leaf yellowing advances, the spear (youngest) leaf collapses and hangs down in the crown (Fig. 6). Death of the apical meristem (bud) usually occurs when one-half to two-thirds of the crown is yellowed. Eventually, the entire crown of the palm withers and topples, leaving a bare trunk. Infected palms usually die within 3 to 5 months after the first appearance of the symptoms.

Initially, in the affected palms root system is not damaged much whereas in advance stage, 70 percentage of root system is damaged (Fig. 7). There is no bleeding patch on the stem. Internal tissues of the stem are also healthy and there is no rotting or discolouration.

#### How the disease differs from other known coconut diseases ?

##### Basal Stem Rot (BSR) - *Ganoderma lucidum*

In basal stem rot (BSR) disease caused by *Ganoderma lucidum* death of spear leaf and drooping of leaves leading to mortality of the palm is observed as in the new disease. But in BSR, the first prominent symptoms are bleeding patches on the basal stem and rotting of root tissue will take at least 1½ to 2 years for the death of the palm (Bhaskaran et al., 1990). But in the new disease, root rot is observed during advanced stage and there is no bleeding patch on the stem and the affected trees dies within 3-5 months of the first appearance of the symptom. Thus, this new disease differs from BSR.

##### Bud rot - *Phytophthora palmivora*

Rotting of central spear leaf is observed in the bud rot disease caused by *Phytophthora palmivora* also as in the new disease. In bud rot disease, the first prominent symptom is the rotting of spear leaf, but in the new disease, bud rot occurs during advanced stage of the disease.



(Fig. 7).

#### Root (Wilt) - *Phytoplasma*

Yellowing of leaflets, necrosis of spathe and spadix are the symptoms associated with root (wilt) disease of coconut caused by *Phytoplasma*. This is a slow debilitating disease and the palms rarely succumb to the disease. But in the new disease reported in this article, there is quick mortality of the infected palms. The affected palms usually die within 3 to 5 months after the first appearance of symptoms.

#### Further Research

Though the new coconut disease resulted in sudden mortality of the palm, observations made so far indicate that the disease is not spreading to the adjacent palms. But in Mankottainatham village, the disease is spreading to the adjacent palms also in few places with a distance of 25 to 75 m within a garden. Research work is in progress at Coconut Research Station, Veppankulam in collaboration with ICAR-Central Plantation Crops Research Institute, Regional Station, Kayamkulam, Kerala to find out the etiology of disease and the integrated practices to manage the disease.

Farmers who observe coconut palms with symptoms described in this article are requested to inform the Professor and Head, Coconut Research Station, Veppankulam - 614 906, Thanjavur District, Tamil Nadu, Phone Number: 04373 – 260 205, 260 124.

**References:** Bhaskaran, R., Vaithilingam, R., Ramanathan, A., Natarajan, C., Marimuthu, R. and Subramanian, K.V. 2007. A new lethal disease of coconut in Tamil Nadu. *Indian Coconut Journal*, 38 (July 2007): 2-4. Acknowledgment Authors are thankful to Dr. P. Chowdappa, Director, and Dr. H.P. Maheswarappa, PC (Palms), ICAR-CPCRI, Kasaragod, for their valuable guidance and support. We thank coconut farmers who have reported and cooperated during the period. \*Corresponding Author: E-mail: thangeshagri@yahoo.co.in ■