



## Transmission electron microscopy confirms phytoplasmal etiology of Tatipaka disease of coconut

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### Abstract

Tatipaka disease is a peculiar disease on coconut palm in Andhra Pradesh causing irrevocable loss to the affected palms. Transmission Electron Microscopy revealed the presence of particles having triple layered membrane in phloem vessels of tatipaka diseased leaf samples. These phytoplasma particles ranged from spherical bodies of about 100 nm diameter to large irregular spherical bodies of 1000 nm. However, in the present investigation, no phytoplasma could be detected in Tatipaka diseased samples of peduncle, spathe and in nut samples. Absence of these phytoplasmas in peduncle, spathe and nut region indicate the irregular distribution of phytoplasmas in the tissues of diseased coconut palm. Further work on the distribution of Phytoplasmas in diseased tissues of coconut palm and transmission of disease is necessary to locate the exact multiplication of site of the Phytoplasmas in coconut palm.

**Key words:** Coconut, Phytoplasma, Transmission Electron Microscopy

### Introduction

Coconut palms are grown in India in an area of 1.84 million hectares with a production of 23,597.3 million nuts and a productivity of 6,847 nuts/ha annually. Kerala, Tamil Nadu, Karnataka and Andhra Pradesh are the states where the palms are predominantly grown. Productivity of Coconut in these regions is impeded by several diseases and disorders. Tatipaka disease is a peculiar disease of the coconut palm in Andhra Pradesh causing irrevocable loss. The disease manifests generally on palms in the age group of 20 to 60 years whereas young palms (below 20 years) are seldom affected (Rao et.al. 1966; Narasimhachari, 1990; Anonymous. 2001). Reduction in number and size of the roots and extensive root rot are the underground symptoms on the diseased palm. Tapering of the stem below the crown, reduction in size and number of leaves, reduction in number of bunches and reduction in crown size are the diagnostic features above ground level (Rajamannar *et al.*, 1994).

Present investigation was carried out to confirm the phytoplasmal etiology through Transmission Electron Microscopy.

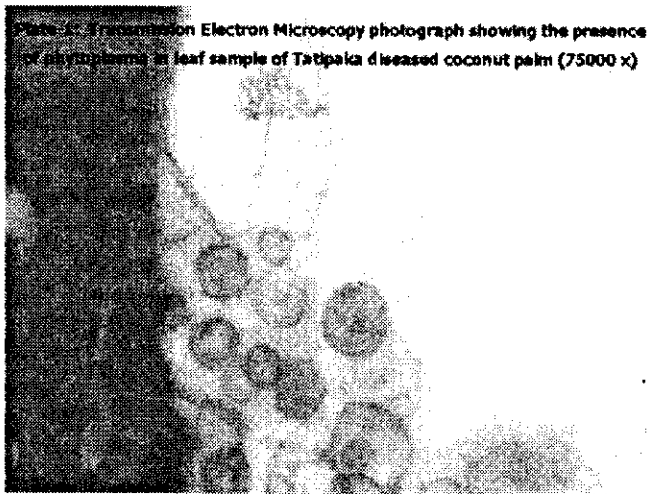
### Materials and Methods

Ten samples of leaflets, spathe and nut from 25 years old Tatipaka diseased and healthy coconut palms were collected from Konaseema area of East Godavari district of Andhra Pradesh. The samples were immediately transferred to 3% Glutaraldehyde and post fixed in 2% Osmium tetroxide and then subjected to complete dehydration. The samples were embedded in sulphur resin and the tissues were cut to seventy nanometer thickness with Lieca Ultra Cut UCT-GA-D/E-1/00 at Ruska Laboratories, ANGRAU, Hyderabad. The grids were stained with saturated uranyl acetate and lead citrate. The sections were examined under transmission electron microscope model Hitachi H70500 at Ruska Labs, ANGRAU, Rajendranagar, Hyderabad.

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## Results and Discussion

Transmission Electron Microscopy revealed the presence of particles having triple layered membrane in phloem vessels of tatipaka diseased leaf samples (Plate-1). These particles were of different shapes indicative of their pleomorphic nature, ranging from small spherical bodies of about 100 nm diameter to large irregular spherical bodies of 1 µm. These characteristics of the particles suggest that they are phytoplasmas. Presence of mycoplasma like organism, rod shaped virus like particles, cytoplasmic crystalline inclusion like particles and rare inclusions looking like parallel arrays of virus particles in Tatipaka diseased coconut leaf were reported by Randles and Hatta, 1980. Presence of MLO's in phloem of diseased leaf was confirmed using Diane's stain by using fluorescent microscopy (Rajamannar *et al.*



1994). However, in the present investigation, no phytoplasma could be detected in Tatipaka diseased samples of peduncle, spathe and in nut samples. Absence of these phytoplasmas in peduncle, spathe and nut region indicate the irregular distribution of phytoplasmas in the tissues of diseased coconut palm. Since, the samples in the nut region of diseased palms did not contain any phytoplasmas the results also indicate that phytoplasmas are not seed borne in coconut palm reiterating the fact that Tatipaka is not a seed borne disease. However, further work on the frequency and distribution of phytoplasmas in diseased tissues of coconut palm and

transmission of disease is necessary to locate the exact multiplication site of the causal agent and also to establish the transmission of phytoplasmas. Ramapandu and Rajamannar (1983) reported that the causal agent is not sap transmissible, by using different tissues of the palm. Besides, the role of leaf hoppers viz., *Sophonia greeni*, *Idioscopus nigroclypeatus*; lacewing bug (*Stephanitis typicus*) and mealy bug (*Palmiculter* sp) occurring on coconut (Rajamannar *et al.*, 1994) may also be studied in transmission of the disease. Although, tetracycline group of antibiotics cause remission from the disease apparently, the recovery is temporary, with the disease appearing immediately after the cessation of the antibiotic treatments (Maramorosch *et al.*, 1977).

Present investigation on Tatipaka disease of coconut palm by electron microscopy confirmed that the causative agent is phytoplasma and also their non-seed borne nature in the coconut palm. Recent surveys conducted revealed that the Tatipaka diseased palms were at negligible level (below 1%). The Tatipaka infected palms were identified and were marked for eradication, to check the further spread of disease.

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