# ASSOCIATION OF BACTERIA WITH ROOT WILT OF COCONUT IN KERALA

D. N. SRIVASTAVA[1], G. S. SHEKHAWAT[2] and Y. P. RAO[3]

Received May 19, 1969

The coconut root wilt has affected nearly 200 thousand hectares of plantations in central Kerala. Losses in nut yield are estimated to range from 40 to 80 per cent amounting to several crores of rupees annually.

Despite researches extending over many decades, the cause of the disease has remained a mystery. According to the published reports (Nagaraj and Menon, 1956; Shanta *et al.*, 1960; Shanta and Menon, 1960, 1961; Menon and Shanta, 1962), root wilt of coconut (*Cocos nucifera* L.) is considered to be due to a virus. Very recently, Summanwar *et al.* (1969) have shown that expressed saps of roots and leaves of diseased palm subjected to simple differential ultra-centrifugation, produced a few local lesions on *Chenopodium amaranticolor* Coste & Rein. Cowpea (*Vigna sinensis* (L.) Savi ex Hassk.), reported earlier as a host of coconut-wilt virus by Shanta and Menon (1960), did not get infected by such saps. The purified saps, when viewed under the electron microscope, revealed the presence of rod-shaped particles identical to those observed in similar preparations from local lesions produced on *C. amaranticolor*. Based on these studies they concluded that the root-wilt disease of coconut is of virus origin.

While this work establishes the association with diseased palms of virus-like particles capable of producing local lesions on *C. amaranticolor*, it cannot be taken as conclusive proof of the virus nature of the disease unless typical symptoms of the disease are reproduced on healthy palms by inoculating the virus.

In any diagnostic investigation, all agencies which are known to incite plant diseases must be visualized and sought for until the cause is definitely established. It is amazing to see that the cause of this 90-year-old undiagnosed disease has never been investigated from the bacterial angle. An examination of the disease was therefore undertaken from the bacterial view point and the observations are reported here.

Roots of diseased and apparently healthy palms were received from Dr S. B. Lal, Director of the Central Coconut Research Station, Kayamkulam, Kerala. When longitudinal slices (1 cm × 0·5 cm) of the vascular tissues from roots of diseased palms were mounted in water and examined microscopically, bacterial streaming was noticed from 2–3 discrete sites on both the vertical edges at corresponding points of the vascular vessels suggesting bacterial invasion of the vascular system. This was a consistent feature of roots of diseased palms. Roots from apparently healthy palms did not show any similar presence of bacteria.

Large number of bacterial colonies were obtained when dilutions of the macerate of the vascular tissues from sterilized pieces of the infected root were streaked on

[1] Deputy Agricultural Commissioner (Plant Protection), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi; [2] Post-graduate student; [3] Plant Bacteriologist at the Indian Agricultural Research Institute, New Delhi.

potato-sucrose agar and incubated for 48 hr at 30°–35°C. The colonies were identical. From the morphological, cultural and biochemical studies of these single-colony cultures, the bacterium has been tentatively placed in the genus *Pseudomonas*.

Bacterial streaming from vascular vessels of roots of the diseased palms cannot be interpreted as being merely casual. It strongly suggests a diseased condition. The fact that the bacterium seems to be a *Pseudomonas* further strengthens this view, since many members of this genus are known to be notorious plant pathogens, some of them inciting wilt symptoms and others known to produce powerful toxins.

Carefully planned pathogenicity tests would be necessary to confirm or otherwise the bacterial nature of the root-wilt disease. If it is conclusively established, the Cadang-Cadang disease in the Philippines and the 'withering' disease in Ceylon, which have much in common with the root wilt, and several other similar problems of coconut decline of unknown etiology in some other countries (Maramorosch, 1964), will need to be examined from the bacterial angle.


## ACKNOWLEDGEMENTS

Grateful acknowledgements are made to Dr A. B. Joshi, Deputy Director-General (Crop Sciences), Indian Council of Agricultural Research, for his keen interest in this work. Thanks are also due to Dr S. B. Lal, Director, Central Coconut Research Station, Kayamkulam, Kerala, for making available the roots of diseases and healthy coconut palms.


## REFERENCES


MARAMOROSCH, K. 1964. *Survey of Coconut Diseases of Unknown Etiology*, 73 pp. FAO Monograph, FAO, Rome.

MENON, K. P. V. and SHANTA, P. 1962. Soil transmission of the coconut-wilt virus. *Curr. Sci.* **31**: 153–4.

NAGARAJ, A. N. and MENON, K. P. V. 1956. Note on the wilt (root) disease of coconut palm in Travancore-Cochin. *Indian Coconut J.* **9**: 161–5.

SHANTA, P. and MENON, K. P. V. 1960. Cowpea (*Vigna sinensis*), an indicator plant of the coconut wilt virus. *Virology* **12**: 309–10.

SHANTA, P., MENON, K. P. V. and PACHU PILLAI, K. 1960. Actiology of the wilt (root) disease. Investigations on the virological nature. *Indian Coconut J.* **13**: 56–66.

SHANTA, P. and MENON, K. P. V. 1961. Studies on some properties of the coconut wilt virus. *Indian Coconut J.* **15**: 36–46.

SUMMANWAR, ARVIND S., RAYCHAUDHURI, S. P., JAGDISH CHANDRA, K., NAM PRAKASH and LAL, S. B. 1969. Virus associated with coconut root (wilt) disease. *Curr. Sci.* **38**: 208–10.