

Occurrence of Phenols in Soils of Healthy and Yellow Leaf Disease Affected Arecanut Palms

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The decomposition of organic matter under anaerobic conditions yields a number of phenolic compounds, some of which being phytotoxic (Patrick 1971) affect the growth and yield of crops and cause injury to the root system. Leaf yellowing is one of the symptoms induced by these toxins (Patrick 1971; Elliott *et al.* 1978). The phenolic acids have been reported to inhibit the growth of sugarcane (Wang *et al.* 1967) and rice (Chandramohan *et al.* 1973). Yellow leaf disease of arecanut (*Areca catechu* Linn.) has been a malady of unknown etiology, prevalent in most of the arecanut growing areas in southern part of India. This disease is found to be more acute in low lying areas; waterlogged condition generally makes the palms more susceptible to it. Water-table in affected plantations is usually high, between 10–20 cm during the period of symptom emergence. Arecanut palm infested with yellow leaf disease showed poor spread of roots, blackening of root tips and decay of the entire root system in due course (Mathai 1976). It is essentially an irrigated crop and large quantities of organic manure are added annually. It is likely that the intermediary decomposition products of organic matter accumulate under reduced conditions. Therefore, a preliminary study was undertaken to investigate the occurrence of

phenols in soils of healthy and yellow leaf disease affected arecanut palms.

Soil samples were collected from the basins of normal and diseased palms in gardens of South Kanara district of Karnataka state from 0–25 and 25–50 cm depths, 40 cm away from the bole, during the mid-monsoon period (July). The samples were obtained from the basins of 12 healthy and 12 diseased palms.

Phenolic compounds were extracted from the wet samples with cold ethanol (85%) and diethyl ether as per the procedure of Chandramohan *et al.* (1973) and also with alkaline ethanol (95%, pH 11.0) and diethyl ether following the method of Wang *et al.* (1967). Total phenols in the extracts was estimated colorimetrically with Folin-Ciocalteu's reagent (Bray & Thorpe 1954) using caffeine as the standard. Soil moisture and gravel content (>2 mm) in each sample were determined and the values computed on oven-dry basis.

Data on total phenols are presented in table 1. Total phenols were, in general, found to be more in the soils of diseased palm basins than in those of healthy ones, except at the lower depth (25–50 cm) in case of cold ethanol extract. The samples from 25–50 cm depth had a lower content of total phenols than the

Table 1. Total phenols in soils under healthy and yellow leaf disease affected arecanut palms ($\mu\text{g}/100\text{g}$ oven-dry soil)

(Average of 6 samples)

Sample	Cold ethanol extract		Alkaline ethanol extract	
	d ₁	d ₂	d ₁	d ₂
Healthy	1677	1435	2799	2305
Diseased	2133	1207	4004	2470

*d₁: 0 to 25 cm; d₂: 25 to 50 cm

upper layer (0–25 cm). The difference in the amount determined in soils under healthy and diseased palms was more marked in the 0–25 cm layer than in the lower depth, where the contents get evened out. Though the variability in total phenol concentration of the soils was fairly large, the affected palm basins had invariably a higher content of phenols than the healthy ones (Table 1). Wang *et al.* (1967) observed that the concentration of soil phenolic compounds could sometimes reach a high level to be detrimental to plant growth.

The results of this study indicate that accumulation of phenols in soil might cause injury to the root system resulting in physiological disorder in the plant.

Acknowledgement

The authors are grateful to Dr. K.V. Ahamed Bavappa, Director, Central Plantation Crops Research Institute, Kasaragod for his keen interest and for providing facilities during the course of this investigation.

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(Received November 1984, Accepted November 1985)