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Note on the investigation on the mineral accumulation of arecanut palm affected by yellow-leaf disease

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The yellow-leaf, a serious disease of arecanut palm (*Areca catechu* L.), is very common in Kerala, central Maharashtra and parts of Karnataka and Tamil Nadu. The symptoms are yellowing of leaves and brown necrotic streaks, which run parallel to the laminae appear in the unfolding leaves. Yellowing starts from the apex of the leaflet and gradually spreads to the entire pinna. In severe cases leaves get reduced in size and become stiff, pointed and bunchy, and then finally fall off. The root-system is poorly developed in affected palms, and the absorbing portions of the young roots become dark and gradually rot away. The endosperm turns black and becomes unfit for consumption.

Quick tests for plant and soil samples were carried out in 10 healthy and diseased arecanut gardens of the Palode tract in the Trivandrum district. The results showed that there are less amounts of major nutrients (N, P, K, Mg except Ca) and higher concentrations of Fe and Al in disease-affected gradens (Yadava *et al.*, 1969). The exact cause and nature of the spread of yellow-leaf disease is not known, though intensive investigations from the various angles are under way (Menon, 1963; Dastagir, 1963; Srivastava *et al.*, 1970; Yadava *et al.*, 1969b, 1971). The early work indicates that adverse soil conditions such as water-logging, acidity and lack of balanced nutrients are the probable causes of the disease. However, the accumulation of minerals in arecanut palms affected by the yellow-leaf disease has not been studied so far with respect to seasons. Hence the present investigation was taken up.

Leaf samples for analysis were taken in 1970 from 10–15-year-old healthy plants and those affected by the yellow-leaf disease growing in the farm of the Central Plantation Crops Research Institute's sub-station at Palode. Leaf samples were prepared from the leaflets collected from both sides of the midrib in the mid-region of the third leaf (from bottom) at bimonthly intervals.

The total N was estimated by the micro-Kjeldahl method (AOAC, 1960), P by the colorimetric method (Kitson and Mellon, 1944), K by the flame-photometer method (Le Poidevin and Robinson, 1964), Ca by oxalate method (Johnson and Ulrich, 1959), and Mg by the colorimetric method (Yadava *et al.*, 1969a).

The leaf samples collected from healthy palms showed higher accumulation of N, P, K and Mg (except Ca) when compared with the diseased palms, and the results were statistically significant (Table 1). Similarly, the amounts of nutrient elements were greatly influenced with different times of collection in healthy and diseased tissues. In general, healthy tissues showed higher accumulation of nutrients throughout the season than the disease-infected tissues, perhaps because of lower dry weight per unit area of arecanut palm. The less amount of nutrients in the diseased tissues may be attributed to the impaired protein synthesis and amino acid metabolism, because protein synthesis in higher plants depends more on the secondary metabolism of amino acids than on the primary assimilation of inorganic N, and arginine is one of the chief com-

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Table 1. Mineral metabolism in arecanut leaves affected with yellow-leaf disease

Date of collection	N (%) in diseased tissues	Increase or decrease (%) over healthy	P (%) in diseased tissues	Increase or decrease (%) over healthy	K (%) in diseased tissues	Increase or decrease (%) over healthy	Ca (%) in diseased tissues	Increase or decrease (%) over healthy	Mg (%) in diseased tissues	Increase or decrease (%) over healthy
February	1·281	+13·50	0·326	+13·98	0·764	+16·41	0·810	−45·94	0·810	− 7·85
April	1·354	+ 4·31	0·397	+10·18	1·029	+ 2·37	0·638	+23·68	0·681	−11·09
June	1·128	+17·72	0·352	+ 9·74	0·945	−10·52	0·870	−34·46	0·688	+ 8·38
August	1·348	+10·49	0·389	+ 7·60	0·794	+12·07	0·613	−18·79	0·846	+ 2·98
October	1·335	+15·66	0·401	+11·47	0·769	+13·49	1·123	−31·49	0·756	+ 7·80
December	1·276	+14·87	0·420	− 9·37	0·915	− 3·12	0·693	+15·59	0·838	+ 0·82
Mean	1·287		0·381		0·869		0·792		0·770	
CD at 5%	0·129		0·041		0·139		0·193		NS	

pounds involved in the mobilization and translocation of N and other compounds (Yemm and Folkes, 1958). A low level of K content causes heavy accumulation of asparagine and glutamine amino acids in mature leaves of fruit trees (Truog, 1961; Lewis *et al.*, 1963). The metabolic index in the infected leaves reflect the upset of nutrient status in arecanut palms because the susceptibility to the disease is reflected on the regulation of protein synthesis. Phytoalexins, phenols and auxins may also exert their effects on resistance via protein metabolism or otherwise.

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