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EFFECT OF ALUMINIUM ON THE GROWTH OF *ARECA TRIANDRA* ROXB. IN SAND CULTURE

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Contribution 154

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ABSTRACT

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Aluminium above 4 mg/l reduced the growth of areca nut seedlings. Mobilisation of phosphorus from root to shoot was observed above 8 mg/l aluminium.

INTRODUCTION

Areca nuts (*Areca catechu* L.) are grown in acidic soils of Karnataka and Kerala states of India. These soils have been found to possess excessive amounts of exchangeable aluminium (Mohapatra et al., 1975). The extent of damage caused to the crop by this element is not known. With a view to finding out the toxic effects of aluminium, a sand culture experiment was conducted, using *Areca triandra* Roxb. as a test crop.

MATERIAL AND METHODS

One-month old seedlings of *Areca triandra* Roxb. were planted, after removing the nut portion, in 1-litre flasks containing 1 kg acid-treated sand. The flasks were double-coated with black and white paints one above the other. The seedlings were established for about 45 days by artificially feeding with Hoagland solution adjusted to pH 4.00 (Hewitt, 1952).

Aluminium chloride at 0, 4, 8, 12 or 16 mg/l concentrations in the nutrient solution, adjusted to pH 4.00, was fed to the plants for 150 days. The treatments were replicated 4 times. After this period the seedlings were removed and washed with water. The growth characteristics, viz. number of leaves produced, shoot and root elongation, shoot and root dry matter and colour of the root tips, were recorded.

Phosphorus in the root and shoot was determined (Jackson, 1967).

RESULTS AND DISCUSSION

Aluminium showed a depressive effect on the growth of the seedlings (Fig.1). Symptoms of damage were more conspicuous on the root system. Discolouration of the root tips, stunted growth of the roots and sparse distribution of root hairs were the prominent characteristics induced by excess aluminium. However, there was no significant decrease in root dry matter (Table 1).

Leaf emergence, elongation and shoot dry-matter production were greatly reduced at aluminium concentrations above 4 mg/l (Table 1), but the toxic symptoms of excess aluminium observed on the root system was not manifest on the foliage. This is in agreement with the observations made on other crops by McLean and Gilbert (1927) and Foy and Brown (1963).

Table 1 also shows that low quantities of aluminium (4 mg/l) induced a stimulatory effect on the growth of seedlings. It seems as if areca nut is neither sensitive nor tolerant to aluminium as per the classification of McLean and Gilbert (1927).

Phosphorus concentration became higher in the shoot than in the root. This suggests that there may be a mechanism of aluminium-induced phosphorus accumulation in areca nut similar to Montery pine and cotton plants (Humphries and Truman, 1964; Foy and Brown, 1963, 1964).

Fig. 1. From left to right: plants grown in 0, 4, 8, 12 or 16 mg/l Al.

TABLE 1

Growth characteristics and phosphorus concentrations in shoot and root of areca seedlings as affected by graded doses of aluminium: means of 4 replications

Al conc. (mg/l)	No. of leaves emerged	Shoot length (cm)	Shoot dry matter (g)	Root length (cm)	Root dry matter (g)	Colour of root tips	Phosphorus (mg/l)	
							Shoot	Root
0	4	22.2	1.026	4.1	0.413	White	372	393
4	3	26.0	1.403	4.7	0.534	White	490	433
8	2	17.8	0.692	3.4	0.360	Brown	565	256
12	1	17.7	0.641	3.3	0.352	Black	728	262
16	1	16.9	0.453	1.7	0.359	Black	769	271
LSD ($P = 0.05$)		4.7	0.424	1.4	0.102		157	103

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REFERENCES

Foy, C.D. and Brown, J.C., 1963. Toxic factors in acid soils. I. Characterisation of aluminum toxicity in cotton. Soil Sci. Soc. Am., Proc., 27: 403—407.

Foy, C.D. and Brown, J.C., 1964. Toxic factors in acid soils. II. Differential aluminum tolerance of plant species. Soil Sci. Soc. Am., Proc., 28: 27—32.

Hewitt, E.J., 1952. Sand and water culture methods used in the study of plant nutrition. Commonw. Bur. Hortic. Plant. Crops (G.B.), Tech. Commun. No. 22.

Humphries, E.R. and Truman, R., 1964. Aluminum and phosphorus requirements of *Pinus radiata*. Plant Soil, 20: 131—134.

Jackson, M.L., 1967. Soil Chemical Analysis. Prentice Hall, New Delhi.

McLean, F.T. and Gilbert, B.E., 1927. The relative aluminum tolerance of crop plants. Soil Sci., 24: 163—175.

Mohapatra, A.R., Bhat, N.T. and Devaraju, C., 1975. Evaluation of micronutrient status of soils from healthy and yellow leaf disease affected areca nut gardens. J. Indian Soc. Soil Sci., 23: 71—75.