NUTRITIONAL STUDIES ON HIGH YIELDING COCONUT GENOTYPES

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ABSTRACT

Nutrient composition of leaves and available nutrient status of soil (0–50 cm) of a five-year-old coconut plantation were evaluated from a field experiment, consisting of three levels of fertilizers and three high yielding coconut genotypes, *viz.*, high yielding Tall, Tall × Dwarf and Dwarf × Tall conducted in the acid sandy loam soil of Central Plantation Crops Research Institute, Kasaragod. N and K contents of leaves averaged over genotypes for fertilizers increased significantly from 1·40 and 0·46 per cent of dry matter in the no fertilized plots, to 1·55 and 0·92 per cent respectively in plots receiving highest amount of fertilizers (1·0 kg N, 1·0 kg P_2O_5 and 2·0 kg K_2O per tree in an year). There was an inverse relationship between K and Mg content of leaves, but Ca content did not vary much.

Leaf P content did not increase significantly. However, available P in surface soil of highest fertilizer treatment increased significantly (131 ppm) over that of no fertilizer (20 ppm), whereas the corresponding values of exchangeable K increased from 23 to 59 ppm. But available nitrogen in soil did not vary. The variations between genotypes and genotype × fertilizer interaction were not significant.

INTRODUCTION

FERTILIZER requirement of the West Coast Tall variety of coconut palms has been worked out by Nelliat and Muliyar (1971) under field conditions. This schedule cannot be effectively adopted to new hybrids and other types with high yield potential developed in recent years. Marar (1962) reported the differential response to fertilisers of palms of different yielding capacities; besides difference in growth of young palms of Dwarf × Tall, Tall × Dwarf, and Tall high yielding types has been reported by Nelliat and Muliyar (1971). Thus, D×T palms were more vigorous in growth than T×D and high yielding Tall ranged in between. With this background, studies were taken up to evaluate the nutrient requirements of young palms which differed in growth, and yield. The results are presented in this paper.

MATERIALS AND METHODS

This study was taken up in 1965 on a sandy loam soil under rainfed conditions. The average annual rainfall was about 3,000 mm. The treatment consisted of three genotypes, *viz.*, West Coast Tall (high yielding), Dwarf × Tall, and Tall × Dwarf, and three fertilizer levels: F_0—no fertilizers, F_1—0·5 kg N, 0·5 kg P_2O_5 and 1·0 kg K_2O and F_2—1·0 kg N, 1·0 kg P_2O_5 and 2·0 kg K_2O. The sources of fertilizers were ammonium sulphate, superphosphate and muriate of potash. This was laid out in randomised block design with 3 replications. The plot size was 6 palms per plot planted 7·5 m apart.

Meterials from this experiment in the sixth year of growth were utilized for this study. Twentyseven soil samples (each being a composite of six samples) were drawn from 90 cm away from the base of palm and at a depth of 0–50 cm. Procedure of Chapman (1964) was adopted for collecting leaf samples, which were also bulked as done with the soil samples. Available nitrogen in soil was determined by adopting the method envisaged by Subbiah and Asija (1956), while methods given by Jackson (1967) were followed for available P and K in soil and N, P, K, Ca and Mg in leaf. The data on soil and leaf nutrient status were statistically analysed and are presented in Table I. The leaf nutrient values obtained have been compared with the critical levels (the per cent of the nutrient on a dry matter basis, below which an application of the appropriate fertilizer has a fair chance of increasing the yield) for the respective nutrient as given by Fremond (1964).

Results and Discussion

No considerable build up in the available nitrogen status of the soil was noticed due to higher levels of application of nitrogen over years (Table I). This may be due to high leaching of nitrogen during rains, besides high utilisation by the plant. Good response of coconut to application of nitrogen at prebearing stage has been reported (Nambiar and Pandalai, 1959). The need for applying slow release nitrogenous fertilizers or split application of fertilizers in sandy or sandy loam soils to give a steady supply of nitrogen was evident from the results. A significant increase (from 1·40% at F_0 to 1·55% at F_2 level) in the leaf nitrogen status was noticed. But even at the F_2 level the nitrogen status of leaf did not reach the critical level (1·8%) given by Fremond (1964). Whether further addition of nitrogenous fertilizers will improve growth and increase the level of nitrogen in the leaf is an aspect worth investigating. This probably calls for a reexamination of the critical value for N in the leaf tissue of coconut grown under West Coast conditions of India.

A highly significant increase in available P (by 111 ppm) in the soil was noticed when F_0 and F_2 levels were compared, the difference in availability between F_1 (51 ppm) and F_2 (131 ppm) was greater than that between F_0 (20 ppm) and F_1. The possible reason for this may be that the P fixing capacity of the soil has been satisfied due to the yearly addition of P fertilizers since 1965 thereby increasing the available P status at F_1 and F_2 levels of fertilization. The P status in leaf did not record any significant variation and was near the critical level (0·12 per cent) in all the treatments.

Availability of K was very low at F_0 level (23 ppm) and increased with additional K supply to 56 ppm at the F_2 level. The leaf status of K was abnormally low at F_0 level (0·46%), but it was beyond critical level (0-8%) at F_1 (0-82) and F_2 (0·92%) levels of application of fertilizers. The data is a clear evidence for the high absorption of K by coconut palms. It also indicates that the native soil K level is so low to meet the requirements of the palm. The D×T palms were found to be very susceptible to potash deficiency since it was noticed that five of them under the F_0 treatment got affected by shoot rot disease. Wallace (1951) has stated that the relationship between K deficiency and parasitism is especially pronounced in the perennial plants. When available in sufficient quantities, potash can raise the

TABLE I

Nutritional status of different coconut genotypes under different fertiliser levels

(mean value)

Genotypes	Nutrient status (%) of leaf					Nutrient status (ppm) of soil (0–50 cm)		
	N	P	K	CaO	MgO	N	P	K
West Coast Tall	1·49	0·13	0·68	0·42	0·29	74	66	39
Dwarf × Tall	1·50	0·12	0·74	0·42	0·29	75	64	41
Tall × Dwarf	1·46	0·12	0·77	0·43	0·31	76	71	39
Fertiliser levels								
F_0	1·40	0·12	0·46	0·42	0·30	75	20	23
F_1	1·50	0·13	0·82	0·41	0·32	76	51	40
F_2	1·55	0·12	0·92	0·42	0·26	74	131	56
Mean	1·48	0·12	0·73	0·42	0·29	75	67	40
	$\underline{F_2F_1}F_0$		$F_3F_1F_0$		$\underline{F_1F_0}F_2$		$F_2F_1F_0$	$F_2F_1F_0$
CD (5%)	0·95		0·75		0·50		12	7

resistance of the palms to diseases like shoot rot, leaf rot, grey blight, etc. (Teiwes, 1962.)

The Ca level in leaf did not show any significant variation, while in the case of Mg., there was significant difference between F_1 (0·32 %) and F_2 (0·26 %) levels, but not between F_0 and other levels. The decrease in the magnesium status with high level of K in the leaf may probably be indicating the need for application of Mg along with very high doses of K.

The difference between genotypes and genotype × fertilizer interactions were not significant.

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DISCUSSION

JOSEPH : How many replications were taken for leaf and soil analyses ?

KAMALADEVI : Three.

MONEY : What was the dose of Mg ?

KAMALADEVI : No Mg was applied.