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EFFECTS OF DISCONTINUATION OF FERTILISER APPLICATION ON THE NPK NUTRITION OF COCONUT PALM

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ABSTRACT

The effect of discontinuing fertiliser application for one year on the NPK nutrition of coconut palms which have been receiving the annual recommended fertiliser dose for the last 15 years was studied. High residual accumulation of soil nutrients, especially P and K, was noticed in soil basins consequent on the long continued fertiliser application. Discontinuation of fertilisation brought down the levels of N and K in leaf and exchangeable K in soil, while soil and leaf P levels remained unaffected. It is suggested that once a good soil build up of P has been attained following annual P-application it might be possible to discontinue P-application for certain number of years or readjust the recommended dose by decreasing the quantity of added P without affecting P nutrition of the palm.

INTRODUCTION

THE current annual recommended fertiliser dose for coconut for the west coast areas of India is 0·50 kg N, 0·32 kg P_2O_5, and 1·20 kg K_2O. This is applied in two splits, one-third in May-June with the onset of SW monsoon and two-thirds in August–September with the commencement of NE monsoon, in a basin of 2 m radius opened to a depth of about 20 cm. Thus, the fertilized area for a palm is restricted to a circle of 2 m radius. Regular application of fertilisers over years will not only favour the accumulation of nutrients in this area but also increase loss of nutrients through leaching. Evaluation of residual effects of NPK additions thus becomes important in evolving the most economic fertiliser management schedule for perennial crops like coconut. The present study was, therefore, taken up to examine the distribution of NPK nutrients in palm basins after several annual additions of fertilisers and also the effects of discontinuation of fertilisation on the NPK nutrition of the palm. In addition, seasonal fluctuations in soil and leaf nutrients were also studied.

MATERIALS AND METHODS

Ten palms of 45–50 years age growing on a red sandy loam soil of the Institute and receiving the recommended fertiliser dose annually for about 15 years were used for the study. The soil is acidic (pH 5·5) and has a low CEC of 5·8 meq/100 g. Soil samples were collected at four radial distances from the bole, 90, 120, 150, and 200 cm from two depths, 0–50 cm and 50–100 cm. Each soil sample was formed out of four borings/palm. Leaf samples were taken from the fourteenth leaf as suggested by Chapman (1964). The samples were taken once in the first week of each month for one year from November 1971 to October 1972. The application of fertilisers was discontinued for the duration of the experiment.

Chemical analyses were made, of soil samples for available N (Subbiah and Asija, 1956), Bray-1 P, neutral N NH_4OAC, exchangeable K and, of leaf for Kjeldahl N, and total P and K, following the methods suggested by Jackson (1967).

RESULTS AND DISCUSSION

Relatively higher accumulation of nutrients was noticed near the bole of the palm than away from it (Table I). The concentration gradients, especially of P and K, were more marked than those of N. The differences in concentration of nutrients along the radius of the basin may be due to the uneven spread of fertilisers while applying.

Neither the soil nor the leaf P level fell below the original or the foliar critical level (0·12%) in spite of the discontinuation of the fertiliser application (Figs. 1 and 2). The

TABLE I

NPK concentration gradients in soil basin of coconut (ppm)

Available nutrients	Depth (cm)	Lateral distances from the bole (cm)				Unfertilised area
		90	120	150	200	
N	0–50	143·1	135·2	130·5	143·7	117·0
	50–100	129·9	132·7	128·4	121·9	100·1
P	0–50	40·5	24·0	16·0	16·6	9·0
	50–100	11·3	8·3	8·0	7·6	3·0
K	0–50	189·5	77·5	63·7	59·8	58·0
	50–100	101·7	58·0	50·7	47·1	50·0

CD (0·05) between lateral distances for N = NS, P = 4·4, K = 10·1

CD (0·05) between depths for N = 7·9, P = 3·1, K = 7·8

residual effect of phosphatic fertilisers added over the years as compared to that of unfertilised area (Table I) would have been adequate enough to supply this nutrient to maintain the leaf level at optimum. These observations indicate that in a perennial crop like coconut that is committed to the land for more than

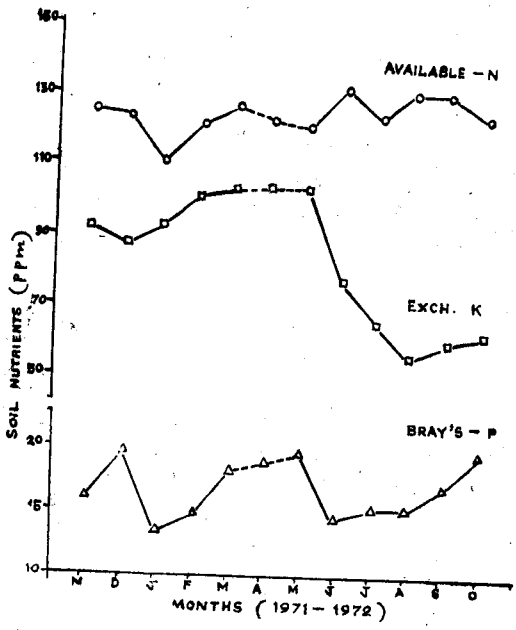

FIG. 1. Seasonal fluctuations in the concentrations of soil available nutrients.

Note; no samples taken in April.

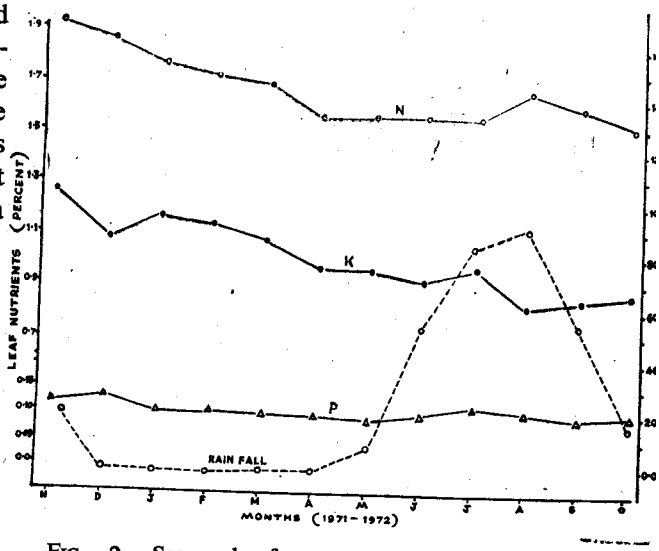

FIG. 2. Seasonal fluctuation in leaf nutrient content.

70 years (average economic life span), skipping of certain years without the application of some of the nutrients may not adversely affect the nutrition when sufficient building up of those nutrients has been attained. Such a method can be followed for at least P. Further studies to find out the rate and frequency of P application based on annual effect or residual effect merit attention especially in the wake of growing awareness of lack of response to P fertilisers in most of the coconut growing countries (Fremond, 1966; Foale, 1966; Smith, 1966; von Uexkull, 1972).

In the case of N and K, leaf levels decreased after manuring was discontinued. At the end of the experiment, leaf N was well below the critical level (1·8%) while the level of K was in the critical range (0·8–1·0%). The drop in levels thus indicates the necessity for annual replenishment of these two nutrients. General improvement in leaf levels of N, P, and K occurred immediately after the onset of rains.

No regular pattern was observed for variation in available nitrogen content in soil in different months (Fig. 1), while a steep fall in both exchangeable K and available P occurred with the commencement of monsoon. Soil K did not increase thereafter while P increased subsequently. The fall in soil K level may be due to leaching while that of P may be ascribed to the fixation by newly formed hydrated oxides of Fe and Al and subsequent release when soil becomes dry. This observation is in agreement with the findings of Muliyar and Wahid (1973).

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