Indian J. agric. Sci. 43(5): 527–528, May 1973

Note on the movement and availability of phosphorus in laterite soil as influenced by heavy phosphorus application with special reference to coconut

M. K. MULIYAR[1] and P. ABDUL WAHID[2]

Central Plantation Crops Research Institute, Kasaragod

Received: 29 June 1972

The lotosols developed in tropics under the influence of high rainfall and temperature are so drastically weathered and heavily leached that they usually give very low soil-test values for plant nutrients. In spite of the low soil P level, the response of coconut (*Cocos nucifera* L.) to phosphatic fertilizers was mostly low. Muliyar and Nelliat (1971) found that continuous annual application of P fertilizers resulted in a significant increase in the yield of coconuts only after 9 years. The present study was taken up to get information on the availability of P in a laterite soil and its mobility as influenced by heavy P application.

The laterite soil of the hill block of the Central Plantation Crops Research Institute, Kasaragod, was chosen. The physico-chemical characteristics of the soil were: coarse sand, 61·40%; fine sand, 5·50%; silt, 9·00%; clay, 20·50%; pH, 5·5; and anion-exchange capacity, 325 mg P/100g soil. Four plots, each separated by bunds, were laid out, of which one was kept as the control with no phosphorus. The others received phosphorus as superphosphate at 3 differential levels, viz. 80 kg P/ha, 160 kg P/ha and 320 kg P/ha. The first application of P was done at the end of August 1966 and second in September 1967. The experiment was discontinued in September 1968. Composite soil samples made from 6 random spots from each plot were taken at bimonthly intervals from July 1967 onward from different depths, viz. 0·0–7·5 cm, 7·5–15·0 cm, 15·0–30·0 cm, 30·0–45·0 cm and 45·0–60·0 cm, and analysed for available P with Bray's No. 1 (0·03N NH_4F+0·025N HCl) extractant. Phosphorus was subsequently determined colorimetrically by the method of Jackson(1967). The mobility of phosphorus was studied considering the increase in the available P fraction at different depths. The 3 variables included in the statistical analysis were level of P, depth and period of sampling.

Statistical analyses showed that availability of P was significantly influenced by the level of applied P, depth and period of sampling. Of all the 3 variables, the level of P contributed maximum toward variation. Application of phosphatic fertilizer resulted in an increased P availability at the end of each year. This may be attributed to a decrease in the phosphorus-fixing potential of the soil by the continuous application of P. The late response of coconut to P reported by Muliyar and Nelliat (1971) may be owing to the slow attainment of a desirable P level in the soil. Perhaps a heavy application during the initial stages may lead to an earlier response of coconut to P.

Considerable movement of P had taken place in the plot receiving 320 kg P/ha. Significant increase in available P (28·7 ppm) was noticed in this plot at 45·0–60·0-cm depth over the control, whereas in plots receving 160 kg P/ha and 80 kg P/ha significant increases in available P were obtained only up to 15·0–30·0 cm and 7·5–15·0 cm depths, respectively, the mean values being 19·9 ppm for the former and 20·6 ppm for the latter. This movement was brought about by the cumulative effect of P applications during 1966 and 1967. Considering the normal dose of phosphatic fertilizer now being

[1]Extension Agronomist (Training), [2]Research Assistant, Division of Soil Chemistry.

applied in coconut gardens (about 0·14 kg P/palm applied in a basin of 150-cm radius), better utilization of added P can be expected if deep placement is resorted to, since the maximum concentraion of active roots lies approximately between 15 and 45 cm from the ground surface.

A steep fall in the extractable soil P occurred with the onset of monsoon, from an average of 95·0 ppm in May to 41·0 ppm in July. The concentration slowly increased in summer to reach maximum in May, just before the rains. This finding is in line with that of Dutch and Scottish workers, as reported by Cooke (1967), that there was less soluble phosphate in soil in the wet periods than in the dry periods. The effect of season on increasing or decreasing the Bray's extractable P can be explained in terms of relative P-fixing capacities of the Fe or Al oxides formed during these periods. Hydrated Fe and Al oxides, which are more likely to be formed in the wet season, can fix P to a greater extent than the dehydrated oxides, which are formed during the summer season. It indicates that there is alternate fixing and release of P as the season changes from wet to dry.

ACKNOWLEDGEMENTS

Thanks are due to Mr K. V. Ahamed Bavappa, Director, Central Plantation Crops Research Institute, Kasargod, and to Mr N. G. Pillai, for their interest and encouragement, to Mr V. T. Prabhakaran for the statistical analysis of the data, and to Mr K. P. Mukundan for assistance in soil sampling.

REFERENCES

Cooke, G. W. 1967. *The Control of Soil Fertility*, pp. 335–6. Crossby Lockuord & Sons Ltd. London SW 7.

Jackson, M. L. 1967. *Soil Chemical Analysis*, pp. 144–6. Prentice-Hall of India Private Ltd, New Delhi.

Muliyar, M. K. and Nelliat, E. V. 1971. Response of coconut palms (*Cocos nucifera* Linn.) to N, P and K fertilizer application on the West Coast of India. *Oléagineux* **26**: 687–91.

Indian J. agric. Sci. **43**(5): 528–529, May 1973

Note on the efficient use of solar energy through a mixed culture of wheat genotypes

RAJENDRA PRASAD and M. R. REDDY

Indian Agricultural Research Institute, New Delhi

Received: 25 April 1973

Efficient use of available solar radiation is the goal of most physio-agronomic research. Mainly there have been 3 approaches to this goal: (*i*) development of plant-ideotypes to suit the environment (Ishizuka, 1969), (*ii*) increasing the cropping intensity, particularly in tropics and subtropics (Dalrymple, 1971; IARI, New Delhi, 1972), and (*iii*) use of reflectors to make more light available to plants (Pendleton *et al.*, 1965, 1966).

There is considerable variability in height in the available wheat germplasm. With planned mixed cultures, it is possible to increase the canopy of wheat fields considerably. In a field experiment we used a tall variety 'NP 824', a single-dwarf variety 'Sonalika' and a triple-dwarf variety 'Moti', and with the seeding arrangement shown in Fig. 1, produced a pyramidal canopy instead of a flat one. The angle (θ) between the bases of 2