The response of cassava to phosphorus fertilizer on five soils in South-East Queensland

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Information is lacking on the fertilizer requirement of cassava, particularly on coastal soils of Queensland, which are of generally low chemical fertility. In relation to phosphorus, the plant response will vary between soil types because of differences in initial P status and buffering capacity. The objective of this work was to investigate effects of P fertilizer application rate and the resulting extractable soil P levels on the growth, P uptake, and yield of field-grown cassava on five diverse soil types.

Methods

The five experimental sites were as follows: 1. krasnozem at Ormiston; 2. yellow earth at Wamuran; 3. yellow podzolic at Mt. Cotton; 4. alluvial loam at Woodford; 5. podzol at Bribie Island. Extractable P levels of the soils are shown in Table 1. The trials were of a criss-cross design with six rates of P application (broadcast superphosphate at planting) and three sequential harvests. The application rates were selected with the aid of phosphate adsorption isotherms'. At planting, a full basal dressing of macronutrients and micronutrients was applied. Planting took place in October 1980 and final harvesting in July 1981. Cultivar M Aus 7 was used, and no irrigation was applied except at planting at Ormiston and Mt. Cotton.

Results and Discussion

Table 1. Final harvest underground storage yields of cassava (fresh weight basis) on five soil types, and initial extractable soil P values.

Soil type	Extractable P* ($\mu g\ g^{-1}$)	Highest rate of P ($kg\ ha^{-1}$)	Yield without P ($t\ ha^{-1}$)	Maximum yield ($t\ ha^{-1}$)	P required for 90% of max. yield ($kg\ ha^{-1}$)
Krasnozem	8	800	32.6	33.8	0
Alluvial loam	9	300	24.2	29.4	20
Yellow earth	11	300	22.7	27.0	20
Yellow podzolic	8	300	9.2	33.1	180
Podzol	3	200	4.6	10.0	10

* 0.5 M $NaHCO_3$ extract

The optimum yields obtained were comparable to the 30-35 t ha levels normally expected in South-East Queensland, except at the podzol site where yield was severely restricted by water stress (Table 1). Water stress occurred to a lesser extent at the other sites and did not markedly affect yields.

Responses of yield to applied P were generally small except on the yellow podzolic and the podzol (Table 1). The yellow podzolic produced a large response to P, and it was noted that the amount of extractable soil P_i in the unfertilized control plots fell to very low values (less than 2 $_{ug}$ g) during the growth of the crop. Apart from this soil, the amount of P required for near-maximum yields under these conditions was small, which reflects the tolerance of cassava of poor soil fertility. The higher P application rates caused yield depressions on the krasnozem and the podzol.

Phosphorus uptake (excluding leaf shedding losses) was increased by P applications on all soils. The relationship between index leaf P status and yield was clearly seen only on the yellow podzolic and the podzol soils, where underground storage yield responded strongly to applied P.

1. Fox, R.L., and Searle, P.G.E. 1978. American Society of Agronomy Special Publication, No. 34, pp. 97-119.