

Extractable Bray-1 phosphorus and crop yields as influenced by addition of phosphatic fertilizers of various solubilities integrated with manure in an acid soil

Abstract

Soil extractable Bray-1 P (B1P) and response to phosphate (P) of *Setaria anceps* cv. Kazungula (*Setaria* grass) were monitored in a field trial bimonthly for 14 months in an acid soil fertilized with triple super phosphate (TSP), Gafsa phosphate rock (GPR) or Christmas Island phosphate rock (CIPR) integrated with or without manure. Extractable B1P from the same soil incubated with the same fertilizers in wet and dry 3-day cycles for 91 days was determined. Field experimental design was randomized complete block (RCB) with three replications. Results indicated that B1P magnitude for field and incubation trial were; TSP > GPR > CIPR, consistent with their solubility. An integration of manure and fertilizers resulted in much higher extractable B1P than sole fertilizers or manure. Over time, P availability decreased at a fast rate for the first 6 months and later was relatively constant. The dry matter yields (DMYs) exhibited quadratic relationships with P rates. Maximum DMYs (6-11 t ha⁻¹) were attained between 100 and 200 kg P ha⁻¹, above which they declined. Average DMYs were not significantly different for TSP, GPR and CIPR (6.1-6.6 t ha⁻¹). Maximum individual DMY were attained at 2-6 months and then declined to a minimum (2-4 t ha⁻¹) after 1 year. Cumulative yields (20-55 t ha⁻¹) also were not significantly different for the three fertilizers. Manure-CIPR integration increased DMY whilst in GPR and TSP/manure combinations DMYs were depressed. The PRs could supplement the expensive TSP without loss of yields but the non-reactive PR should be integrated with manure. © 2009 Springer Science+Business Media B.V.

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