

Short- and Long-term Effects of Sparingly Soluble Phosphates on Crop Production in Two Contrasting Nigerian Alfisols

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Abstract

The effectiveness of Sokoto and Ogun rock phosphates (RP) as substitutes for the conventional phosphorus (P) fertilizer sources in the production of tomato (*Lycopersicon esculentum*) and okra (*Hibiscus esculentus*) were evaluated using single super-phosphate (SSP) as reference. Their residual effects were also investigated using rice (*Oryzae sativa*) and soybean (*Glycine max*). The two experiments were $2 \times 2 \times 4$ factorial combinations with completely randomized design (CRD) involving two crops, two soils, three P-fertilizer sources and a control. The treatment combinations were replicated four times to give a total of 64 pots, each containing 5 kg of either a slightly acid (pH 6.3) alfisol (Typic Paleudalf) A, from Abeokuta (rainforest ecological zone) or a medium acid (pH 5.9) alfisol (Oxic Paleustalf) B, from Zaria (southern Guinea savanna zone). The soils represent a wide range of Nigerian soils with medium to low P-availability and cultivated to various food and economic crops. The rock phosphates (particularly SRP) were more efficient than SSP in soil A but had less than 50% relative agronomic efficiency (RAE) in soil B, especially when tomato was the test crop. They also had higher RAE in soil A than in soil B when okra was grown, though the efficiency was not as high as that of the reference fertilizer. In the slightly acid alfisol (A), ORP was less efficient than SRP whereas it had 47.8% RAE compared with 34.9% RAE for SRP in the medium acid soil. In the second cropping, the soil from the rainforest zone still produced greater biomass than soil B while soybean gave more biomass than rice. The results confirmed that, apart from crop species to be grown, organic matter and clay contents as well as pH of soils should be considered for efficient utilization of the sparingly soluble phosphates for both short- and long- term effects in crop production.