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Full Length Research Paper

Utilization of phosphorus from different sources by genotypes of promiscuous soybean and cowpea in a low-phosphorus savanna soil

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Abstract

The differential ability of genotypes of soybean (*Glycine max*) and cowpea (*Vigna unguiculata*) to thrive under low-phosphorus (P) conditions by utilising P from sources with low solubility was assessed in a greenhouse study with a low-P savanna soil collected from a research field in Fashola, south-western Nigeria. The P sources added (21 mg P kg^{-1} soil) were calcium phosphate (Ca-P), iron phosphate (Fe-P), aluminium phosphate (Al-P), and triple superphosphate (TSP). Soil without P addition served as a control. The soybean genotypes were TGm 1039, TGm 1196, TGm 1293, TGm 1360, TGm 1420, TGm 1511, and TGm 1540. The cowpea genotypes were Dan-ila, IT89KD-349, IT89KD-391, IT90K-59, and IT82D-716. Nearly all the soybean genotypes significantly increased their shoot dry matter yield (DMY) and accumulation of P from the various sources when compared with the control; the ranking for P acquisition was control<Al-P<Fe-P<Ca-P=TSP. The shoot DMY and shoot P accumulation of most of the cowpea genotypes were also significantly increased by the addition of Ca-P, Fe-P, and TSP; the addition of Al-P had no significant effect. The cowpea genotypes varied widely in acquiring P from the P sources. However, the general ranking was control=Al-P<Fe-P<Ca-P=TSP. For both crop species, the shoot DM yields under Ca-P and TSP treatments were not significantly different. From the analysis of shoot P accumulation with the Additive Main Effects and Multiplicative Interaction (AMMI) model, the cowpea genotype IT89KD-391 was better than other genotypes with Ca-P as P source; genotype IT90K-59 was better when Fe-P was the P source. In contrast, most of the soybean genotypes appeared to

have access to the P sources in a similar manner

Keywords: Soybean, cowpea, genotypes, savanna soil, sparingly soluble phosphorus.