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"Development on the margin"

Physiological Efficiency and Combined Effects of Phosphorus and Nitrogen from a Natural Source on the Yield of Maize in Humid Tropical Soil

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Abstract

Cost reduction and an increased efficiency in the utilisation of nutrients are essential to establishing agricultural systems in the tropics. The objective of this study was to investigate the combined effects of calcined Al-phosphate and leucaena pruning on the agronomic and physiological use efficiency of nitrogen (N) and phosphorus (P) in maize. The treatments were as follows: 160 kg ha^{-1} P_2O_5 from Al-phosphate and 100 kg ha^{-1} of N from urea (Al-P+U); 160 kg ha^{-1} P_2O_5 from Al-phosphate and 6 Mg ha^{-1} leucaena dry matter residue (Al-P+L); 160 kg P_2O_5 from single super phosphate and 100 kg ha^{-1} of N from urea (SSP+U); 160 kg P_2O_5 from single super phosphate and 6 Mg ha^{-1} leucaena dry matter residue (SSP+L); and a control without fertilisation. There was a beneficial association between the leucaena and SSP on the growth of the maize, the N and P recovery and the agronomic efficiencies. Both ear weight and grain weight were higher under the SSP + L treatment than under the treatment SSP + U and higher under the Al-P + L treatment than the under the Al-P + U treatment. The low N and P agronomic efficiency in maize grown under the Al-P+U treatment made the combined use of these fertilisers unviable. The satisfactory efficiency of grain production showed by the maize grown under Al-P+L indicated that this treatment may replace processed fertilisers for agrosystems management in the tropics. In addition, these results also indicated that for an even greater increase in the productivity of cereals in tropical agrosystems, efforts should be undertaken to improve the soil rootability to accelerate the root growth to increase the nutrient recovery and dry-matter production before tasselling. At the same time, we must take advantage of the slow release of N by leguminous residues to ensure an adequate N uptake and maintain a high photosynthetic rate in the post-tasselling stage.

Keywords: Al-phosphate, *Leucaena leucocephala*, Low-input agrosystems

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