

The influence of phosphorus fertilizer on maize yield under conditions of slash-and-mulch in Eastern Amazonia

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Content of Abstract:

Phosphorus deficiency is one of the main limiting factors of crop production in Eastern Amazonian agriculture. The predominant soils are Ultisols (U.S. Soil Taxonomy)[KV1], with a pH (CaCl₂) of 4.7 and P_i (Mehlich3) of 3 mg kg⁻¹ soil. In fire-free land preparation, by using slash-and-mulch, this constraint is even amplified due to temporary immobilization processes. Thus, the objective of the present study is the determination of adequate levels of phosphorus so as to achieve feasible productions of maize with this system. In previous works on fertilizer response with maize (Bünemann 1999, Vasconcelos 1999) increments of N, P and K were tested separately, maintaining the two other elements at medium or high levels. It was shown that even high levels of N and K fertilizer did not have any yield effect if no P was applied. With 30, 50 and 60 kg P₂O₅ ha⁻¹, considerable yield increments were achieved. Above 60 kg P₂O₅ ha⁻¹ the effect leveled out. Since the previous experiments did not consider the effect of P without the presence of the two other elements, the present work was conducted with the objective to find out how far P fertilization alone would improve maize yields. The field experiment was conducted in a small holder farm in the municipality of Igarapé Açu, PA, Brazil. The treatments of the experiment were 4 levels of P₂O₅ (0, 30, 60, 90, kg ha⁻¹) interacted with the presence and the absence of both, N at 120 N kg ha⁻¹ and K at 60 kg K₂O ha⁻¹ and with 4 replications. In the presence of medium and high amounts of N and K the results of the previous works were confirmed: maize grain yields were very low or almost close to zero if P was missing, just as if no fertilizer at all was applied. P fertilization alone increased yields from 0 t ha⁻¹ to a yield of 1.3 t ha⁻¹, 2.2 t ha⁻¹ and 2.3 t ha⁻¹ at levels of P₂O₅ of 0, 30, 60, 90 kg ha⁻¹, respectively. As of 60 kg P₂O₅ ha⁻¹ phosphorus does not seem to be the only limiting factor anymore, since further increase did not have any yield effect. This result is also confirmed by the response curves at medium and high N and K levels, two of which are from the previous works by Bünemann (1999) and Vasconcelos (1999) and the third one being from the present work. Concluding, it can be stated that with as well as without the presence of nitrogen and potassium any increment of phosphorus beyond the level of 60 kg P₂O₅ ha⁻¹ is not being reflected in yield performance anymore.