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Soil organic matter as the main factor for corn yield on a fertilised Arenic Acrisol of Northeast Thailand

La matière organique, principal facteur du rendement dans un sol ferrallitique sableux fertilisé de Thaïlande

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In order to find out the most important limiting factors for plant production, some parameters determining the yield of sweet corn were studied in a field experiment at Korat (15 N, 102 E, 1020 mm annual rainfall). The soil was characterised by 5% clay, 4.0 pH_{CaCl2}, 0.94 cmolc kg⁻¹ ECEC, 0.22% C, and 0.019% N (Korat series). Former experiments had indicated P deficiency as the main limiting factor in this soil type (4 mg kg⁻¹ P Bray2). The experiment was a factorial randomised block design with two factors, lime and gypsum. The same high N, P, K, S and Mg fertilisation was applied to all plots in a mungbean/sweet corn rotation. Plant samples were taken from each plot one month after sowing and at flowering, soil samples were taken three times during the year.

The relations between the yield of sweet corn, plant nutrient content and soil analysis were studied using statistical methods. The analysis of variance proved that lime and gypsum had no significant effect on corn yield. Considering all plots irrespective of the treatments, correlation analysis showed that the corn yield was highly correlated with total soil N (r=0.75, n=25, P<0.001). Using stepwise multiple regression analyses, 73% of the yield variations could be explained, 64% by variations in N (total soil N and plant N concentration at flowering), 9% by variations in soil acidity (pH 0.01M CaCl₂).

These results prove that on these acid sandy soils, aluminium toxicity has less influence on sweet corn yield than N supply and that an application of 150 kg N ha⁻¹ (urea and KNO₃, split application) did not meet plant requirements. Accompanying measurements of soil inorganic N suggest that most N fertilizer was lost shortly after application and that the plants had to rely on the mineralization of the small amount of soil organic matter to grow.

Keywords : acid soil, sandy soil, N uptake, N leaching, Thailand

Mots clés : sol acide, sol sableux, prélèvement d'azote, lessivage d'azote, Thaïlande