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"Bridging the gap between increasing knowledge and decreasing resources"

Enhancement of Nitrogen Use Efficiency to Increase Yield and Maize Grain Quality in No-Till Systems

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Abstract

In sandy loam soils of the humid tropics, adverse environmental effects such as low nitrogen use efficiency may impose severe constraints on the exploitation of quality protein maize (QPM) with higher lysine and tryptophan contents. The aim of this study was to test if the combined use of residues in no-tillage alley cropping systems would substantially enhance N use efficiency, grain protein content and grain yield in a sandy loam tropical soil prone to cohesion. We tested the QPM variety BR 473 under four tree leguminous species, *Leucaena leucocephala* (L), *Gliricidia sepium* (G), *Clitoria fairchildiana* (C) and *Acacia mangium* (A). The leguminous species were arranged in mixed rows, with or without urea (U). The experiment was arranged in a randomised complete block design with 10 treatments and four replicates: L+C+U, L+A+U, G+C+U, G+A+U, L+C, L+A, G+C, G+A, B+U, bare soil with urea; and control, bare soil without mineral fertiliser. These residue combinations also increased the protein yield. The increase in grain yield was more important than the influence of N nutrition on grain composition for achieving higher protein production. The great differences among residue treatments indicated that the higher N uptake and also the higher yield of the gliricidia + clitoria + urea treatment could not be accounted for only by the physical and chemical improvements of the root zone. Other factors, such as antagonistic interactions between species, may also be involved and will require further attention in future research. Therefore, to increase the protein yield in cohesive soils of humid tropical regions, the alley cropping system is effective when tree species that do not interact antagonistically with the crops but rather provide nutrients and improve the root environment are used.

Keywords: Alley cropping, leguminous, nitrogen nutrition, quality protein maize

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