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“Solidarity in a competing world —
fair use of resources”

Soil Attributes and Grain Yield of Upland Rice as Affected by Cover Crops

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Abstract

Better understanding of the use of cover crops in no-tillage systems (NTS) in upland rice crop could contribute to an increase in grain production. In the soil, N-NO_3^- and N-NH_4^+ are the main forms of N available to plants, and in aerobic soils nitrate prevails in relation to ammonium. Most plants absorb both nitrate and ammonium. However, upland rice plants in the early stages of development have a reduced capacity for uptake, storage and/or metabolising N-NO_3^- . Some researchers bring up the principal hypothesis that rice seedlings present low activity of nitrate reductase (NR) enzyme. The use of cover crops can change the relation between the mineral forms of N in soils, providing larger amounts of N-NH_4^+ , and may so enable a better development of crops that absorb more this form of N, such as upland rice. The aim of this study was to determine the effect of pearl millet intercropped with other cover crops on mineral forms of N and urease activity in soil, nitrate reductase activity in the leaves of the follow-up rice crop, as well as the yield components of this rice crop. The experiment was performed in the year 2012/2013 at two locations of the Brazilian Cerrado. The experimental design was a complete randomised block with eight replications. The treatments consisted of four types of cover crop [1. Pearl millet (*Pennisetum glaucum*) - control, 2. Pearl millet + *Crotalaria spectabilis*, 3. Pearl millet + *Brachiaria ruziziensis*, 4. Pearl millet + *C. spectabilis* + *B. ruziziensis*]. The results allowed us to conclude that among the cover crops evaluated intercropping with the cover crops pearl millet + *C. spectabilis* provided higher nitrate content in the soil than with pearl millet alone or combined with *B. ruziziensis*. However, no differences were found for the ammonium content and urease in the soil after intercropping, neither for the nitrate reductase activity in the rice leaves, nor for the yield components of the rice crop in a no-tillage system. Nevertheless, our results indicate that the evaluated cover crops could be an important option to be considered for upland rice crop when aiming for higher rice grain yield.

Keywords: Ammonium, *Brachiaria ruziziensis*, *Crotalaria spectabilis*, nitrate, nitrate reductase, *Oryza sativa*, *Pennisetum glaucum*, urease