High Rates of Lime Can Improve Soybean-Millet Performance in the Matopiba Agricultural Frontier of Brazil

Monday, November 11, 2024

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Abstract

Soil acidity is a major limitation to crop productivity, in tropical soils. The MATOPIBA region present irregular distribution of rainfall, and the lime reaction effectively begins with the beginning of the rainy season, coinciding with the recommended soybean sowing period. Therefore, there is not enough time for the lime to react completely before plant establishment. We aimed to evaluate the effects of liming rates in areas newly converted from native Cerrado to the soybean-millet crop sequence in Maranhão, Brazil. The study was carried out in the 2022 crop season at Barbosa Farm, on a Red-Yellow Ultisol (pH_{CaCl2}= 4.5), in randomized blocks following a 5x2 factorial scheme. Five liming rates (3, 4, 6, 8, and 10 t ha^{-1}) and two gypsum rates (0 and 1 t ha^{-1}), with four replicates were used. Soil fertility attributes ($pHCaCl_2$, Ca^{2+}, Mg^{2+}, and Al^{3+}) at the 0.0-0.2 m depth and yield of soybean and millet were measured. The application of gypsum did not influence soil attributes. High liming rates led to an exponential reduction in Al^{3+} (0.006 $cmol_c dm^{-3}$), and increased soil pH (6.25), Ca^{2+} (2.58 $cmol_c dm^{-3}$), and Mg (1.29 $cmol_c dm^{-3}$) concentrations. Soybean seed yield increased with liming rates up to 6 t ha^{-1} of lime. In contrast the yield of millet increased linearly with the liming rate. Moreover, gypsum increased millet grain yield (+37%). The application of 6 t ha^{-1} of lime improved soil chemical attributes and soybean seed yield in the MATOPIBA region. Liming rates higher than usually recommended compensates for the short time available for chemical reactions to occur, improving the performance of soybean-millet cultivation in Cerrado areas recently converted into agriculture.

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