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Reduction of the effects of water deficit on soybean and corn grain yield by the chemical improvement of the rooting layer

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The Oxisols represent 31% of Brazilian soils and their main limiting factor is directly related to their acidity. The grain yield of soybean and corn crops grown in Oxisols with acid subsoil is strongly affected by the availability of water, and the acidity coupled with the chemical and physical impediment, have reduced the deepening of the root system of these crops, intensifying the deleterious effects of the deficit water on the grain yield. The present study aimed to evaluate the effect of the associated use of gypsum and lime as a chemical tool to improve the conditions of the soil rooting layer and, consequently, to mitigate the damage that the water deficit can cause on the soybean and maize grain yield under no-tillage system (NTS). The experiment was carried out in the 2014/15 (soybean) and 2015/16 (maize) crops in a Dystrophic Oxisol with clay texture (Embrapa, 2006) in São Miguel das Missões in Rio Grande do Sul (Brazil), the region's climate is classified as subtropical (Cfa), according to Köppen-Geiger (1948). The treatments contained different doses of gypsum and associated lime, T0 (control); T1 (0.0 Mg ha^{-1} gypsum + 2.0 Mg ha^{-1} lime); T2 (3.0 Mg ha^{-1} gypsum + 2.0 Mg ha^{-1} lime) and; T3 (5.0 Mg ha^{-1} gypsum + 2.0 Mg ha^{-1} lime). The experimental arrangement was of subdivided plots with three replicates. The treatments received rain restriction chambers in subplots during the most critical period of the crop, which excluded 100% of the rainfall. For soybean, there were 30 days of exclusion and 20 days for maize. The soil samples collected was stratified from 0.00 m to 0.60 m. The associated application of gypsum and lime was able to increase the productivity of soybean and corn crops regardless of precipitation being excluded. However, when submitted to water deficit, accumulated productivity increased with the application of inputs (gypsum and lime) was 46% higher in both seasons. The chemical improvement of the soil rooting layer was able to attenuate the productivity losses that the water deficit would cause in soybean and corn crops.

Keywords: Gypsum, lime, soil subsurface, water deficit.

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