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73541 Biomass and Silicon Uptake of Wheat in Response to Different Levels of Plant-Available Silicon.

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Silicon (Si) is one of the most abundant elements found in the Earth's crust, but it is mostly inert and only slightly soluble. Continuous crop cultivation tends to remove large quantities of Si from soil and become deficient for crops for achieving higher yields. Although there is a vast information available in rice and sugarcane in relation to Si fertilization, information is very limited in wheat. The purpose of this study was to evaluate wheat biomass production and Si uptake in response to varying levels of plant available Si. Twelve soils collected from Indiana, Mississippi, Ohio, Michigan and Louisiana were used in this study. Pots filled with approximately 2 kg of air-dried soils were applied with different rates of calcium silicate ($CaSiO_3$) slag at rates of 0, 1, 2, 4, 6 and 8 MT ha^{-1}. A control and two rates of calcium carbonate (1 and 2 MT ha^{-1}) were also included in the treatment structure. The treatments were arranged in a randomized complete block design with four replications. Wheat seeds were sown at the rate of 4 seeds pot^{-1}, allowed to grow before heading and then harvested. Soil and biomass samples were processed and analyzed for Si. The acetic acid-extractable Si of all soils increased linearly with increasing rates of $CaSiO_3$ slag. Wheat grown on soils with initially low acetic acid extractable Si (<85 mg kg^{-1}) with either high organic matter content or low soil pH responded to increasing rates of $CaSiO_3$ slag. With 4 MT ha^{-1} application rate, 2 to 27 % increase in wheat biomass yield was recorded. Reduction in biomass production was observed if $CaSiO_3$ was applied at rates > 4 MT ha^{-1}. The reduction in biomass yield may have resulted from the negative effect of high pH in soil brought about by high application rates of $CaSiO_3$ on the solubility of several plant essential nutrients. The benefit of $CaSiO_3$ slag application for crops requiring large Si supply can be offset by applying this type of Si source at rates large enough to drastically change soil pH hence solubility of several plant essential nutrients.