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75336 Changes in pH and Mehlich-3 Extractable Nutrients of Selected Soils From the Midwest and South USA As Influenced by Different Rates of Iron Calcium Silicate Slag.

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Calcium silicate ($CaSiO_3$) slag is among the sources of silicon (Si) in crop production and commonly obtained as by-products in steel industry and production of elemental P. These slag by-products have high calcium carbonate equivalent (CCE) making them also suitable as liming material. In the USA, $CaSiO_3$ slag is commonly apply to soil cultivated for rice and sugarcane production at quantities ranging between 1 MT to as high as 6 MT ha^{-1}. With high application rates and high CCE value of $CaSiO_3$ slag, the solubility of essential nutrients such as P, Zn, Fe and Mn can be altered. This study was conducted to quantify the effect of different rates of iron and steel $CaSiO_3$ slag by-product (17% Si, 81% CCE) on soil pH and extractable elements of soils collected from the Midwest and South USA. Soils were acidic (pH 5.0) to slightly alkaline (pH 7.4) with wide ranges of Mehlich-3 (M3) extractable macro- and micro-nutrients. Bulk soil samples were processed and placed in 2-kg capacity pots where $CaSiO_3$ slag rates of 0, 1, 2, 4, 6 and 8 MT ha^{-1} were thoroughly mixed with the top 15-cm surface of the potted soil. Soil samples were collected after allowing ryegrass to grow for 3 months. The pH of several soils increased linearly with increasing rates of $CaSiO_3$; these soils either had initially low pH or classified as coarse-textured soils. The highest change in pH before and after $CaSiO_3$ application was a unit of 1.05 for soils which received 8 MT $CaSiO_3$ ha^{-1}. Mehlich-3 extractable Mg, Mn, S, and Ca of all the soils increased with increasing rates of $CaSiO_3$ slag. This can be attributed to the large concentrations of these elements contain in the slag material. The steady decline of M3-extractable Fe and Ni (and Zn in some soils) may be related to the potential of $CaSiO_3$ slag to raise soil pH, hence decreasing the solubility of these metal cations. Our results show that both liming potential and composition of $CaSiO_3$ slag had significant effect on the amount of M3-extractable essential nutrients.