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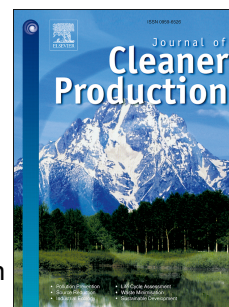
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Beneficial use of a by-product from the phosphate fertilizer industry in tropical soils: effects on soil properties and maize and soybean growth

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ABSTRACT

Phosphate fertilizers are critical for crop production in tropical soils, which are known for having high phosphate-fixing capacity and aluminium saturation, as well as low pH and calcium contents. Fluorine is a component of many phosphate rocks used to make phosphate fertilizers, via a process that generates hexafluorosilicic acid (H_2SiF_6). While many treatment technologies have been proposed for removal of fluorine in industrial facilities, little attention has been given to a process of neutralizing H_2SiF_6 with calcium oxide aiming to find out an alternative and sustainable use of a by-product with a great potential for beneficial use in tropical agriculture. This study evaluated the effect of a by-product of phosphoric acid production (fluorite with silicon oxide, hereafter called AgroSiCa) on soil properties as well as on growth of soybean and corn. Two experiments (2 crops) were conducted under greenhouse conditions in a completely randomized $3 \times 5 \times 2 \times 3$ factorial design as follows: three soils (Red Latosol, Red-Yellow Latosol, and Cambisol), five doses of AgroSiCa (0; 0.5; 1.0; 2.0; 4.0 t ha⁻¹), two doses of phosphorus (2×%clay and 4×%clay), with three replicates, totaling 90 plots for each experiment. The application of AgroSiCa resulted in a slight increase of soil pH. Significant increases in calcium, phosphate, and silicon levels in soil solution and in shoots of maize and soybean were observed at all doses of AgroSiCa. We also found very low levels of fluoride in all soil leachates. Significant reduction of labile aluminium was found in all soils after the cultivation of maize and soybean. In sum, AgroSiCa improved soil properties and contributed to a better

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