

Effect of slag silicate fertilizer on dissolved silicon in soil solution based on the chemical properties of Gleysols

ABSTRACT

Increasing the silicon (Si) supply in soil solution enhances Si uptake by rice plants (*Oryza sativa* L.). In this study, we evaluated soil factors associated with the effects of slag silicate fertilizer (SSF) application on Si supply in soil solution. Nine Gleysols with a wide range of chemical properties were incubated with (tFertilizer) or without (_Fertilizer) SSF for 71 days under submerged conditions, and the amount of dissolved Si, pH, and calcium (Ca) concentration in the soil solutions were determined. The amount of dissolved Si derived from SSF application (Sidff) was estimated using the subtraction method, and a correlation analysis was performed between the Sidff and chemical properties of air-dried soil or the soil solution obtained from the incubation experiment. The percentage of dissolved Sidff from 0.5N hydrochloric acid (HCl)-soluble Si in the SSF varied from 15 to 67% among different soils, suggesting that the effect of SSF on Si supply in the soil solution varied among Gleysols. Dissolved Sidff was negatively correlated with the mean soil solution pH ($P < 0.001$) and Ca concentration ($P < 0.05$) for tFertilizer samples during the incubation experiment, soil pH after incubation under submerged conditions ($P < 0.001$), soil Si adsorption capacity ($P < 0.001$), acid oxalate extractable iron ($P < 0.001$) and acid oxalate extractable manganese ($P < 0.005$), and indicators of soil Si availability ($P < 0.05$). These results suggested that the effects of SSF on Si supply in solution were affected by Si dissolution from the applied SSF and the Si adsorption capacity of the soil.

Key words: chemical properties, Gleysol, silicon, slag silicate fertilizer, soil solution.