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71940 Agronomic and Environmental Impacts of Silicon Fertilizer Application On Rice Grown in Louisiana Soils.

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Studies have shown that silicon (Si) can substantially increase tolerance of rice to biotic and abiotic stresses and it also aids in the growth and nutrient uptake of Si-accumulating crops like rice and sugarcane. However, specific mechanisms responsible for the benefits of Si application are not completely understood. A greenhouse experiment was conducted to elucidate the effects of varying sources of Si-rich materials on rice growth and methane emissions under Louisiana soils. Rice cv. CL261 was planted in pots containing Perry clay or Crowley silt loam soils. Pots were applied with varying rates (0, 4, and 8 MT ha^{-1}) of Si from carbonized rice hull, carbonized sugarcane trash, and calcium silicate ($CaSiO_3$, 17% Si) slag, a by-product of iron and steel production. Both carbonized-rice hull and -sugarcane trash were produced by partial combustion of materials at low temperature. The treatments were arranged in randomized complete block design with four replications. Methane measurements were taken between 8:00 am and 12:00 noon at different growth stages of the crop by taking gas sample from the headspace of an open–bottom chamber. Gas samples were analyzed using gas chromatography equipped with a flame ionization detector. Results showed that application of varying rates and sources of Si fertilizer did not increase plant growth parameters such as tiller number and plant height. Environmentally, $CaSiO_3$ slag reduced methane emission by 17-22% over that of the control in both soil types. The reduction in methane emission can be attributed to the release of active iron oxide from the $CaSiO_3$ slag which is a potential source of electron acceptor eventually resulting in decreased methane emission. Results also showed that carbonized rice hull and sugarcane trash did not enhance methane emission, indicating that these materials may not influence methanogenic and methanotrophic bacterial activities despite containing high amount of carbon. Research on the potential of these Si sources should be continued to understand their agronomic and environmental impacts especially in crop production systems requiring large supply of Si.