Geophysical Research Abstracts
Vol. 19, EGU2017-2011, 2017
EGU General Assembly 2017

Efficacy of Designer Biochars with or without Lime Application for Remediating Heavy Metals in Mine Spoil Soils

Gilbert C. Sigua (1), Jeffrey Novak (1), Mark Johnson (2), James Ippolito (3), Kurt Spokas (4), Thomas Ducey (1), and Kristin Trippe (5)

(1) USDA-ARS, Florence, SC, USA (gilbert.sigua@ars.usda.gov), (2) USEPA, Corvallis, OR, USA, (3) Colorado State University, Fort Collins, CO, USA, (4) USDA-ARS, Minneapolis, MN, USA, (5) USDA-ARS, Corvallis, OR, USA

A multitude of research investigations have confirmed that biochars can increase soil carbon sequestration, improve critical plant nutrient concentrations, and improve the fertility, chemical, and physical properties of degraded agricultural soils. Recently, biochars ability to sequester metals has caught the attention of the mine reclamation sector. It is proposed that biochar is a suitable amendment to remediate heavy metals in mine spoils, as well as improve chemical conditions for enhanced plant growth. Better plant growth will improve phytostabilization, increase containment of metal-laden sediment, while also reducing potential metal uptake by plants. As such, utilization of a biochar with appropriate chemical and physical characteristics is crucial for effective binding of heavy metals while also improving plant growth conditions in mine spoils. Using two different mine spoils, we conducted laboratory and greenhouse experiments to determine the ability of designer biochar with or without lime application to favorably improve soil pH, reduce heavy metal bioavailability, and improve grass (e.g., wild blue rye) plant nutrient uptake. Preliminary results showed that our designer biochars did increase pH of acid mine spoils significantly ($p<0.001$), improved uptake of critical plant nutrients (e.g., phosphorus, potassium and calcium), and significantly ($p<0.001$) reduced the concentrations of heavy metals (e.g. aluminum, chromium, zinc, nickel, zinc, manganese, copper and cadmium) in the soils.