Geophysical Research Abstracts
Vol. 18, EGU2016-8713, 2016
EGU General Assembly 2016

Changes on aggregation in mine waste amended with biochar and marble mud

María Ángeles Muñoz (1), Jose Guzmán (2), Raúl Zornoza (1), Fabián Moreno-Barriga (1), Ángel Faz (1), and Rattan Lal (2)

(1) Universidad Politécnica de Cartagena, ETSIA, CYTA, Cartagena, Spain (mangeles.munoz@upct.es), (2) Carbon Management and Sequestration Center. The Ohio State University

Mining activities have produced large amounts of wastes over centuries accumulated in tailing ponds in Southeast Spain. Applications of biochar may have a high potential for reclamation of degraded soils. Distribution, size and stability of aggregates are important indices of soil physical quality. However, research data on aggregation processes at amended mining tailings with biochar are scanty. Therefore, the aim of this study was to determine the effects of seven different treatments involving biochar and marble mud (MM) on the aggregation in mine waste (MW). Seven different treatments were tested after 90 days of incubation in the laboratory. These treatments were the mix of MW and: biochar from solid pig manure (PM), biochar from cotton crop residues (CR), biochar from municipal solid waste (MSW), marble mud (MM), PM+MM, CR+MM, MSW+MM and control without amendment. High sand percentages were identified in the MW. The biochars made from wastes (PM, CR, MSW) were obtained through pyrolysis of feedstocks. The water stability of soil aggregates was studied. The data on total aggregation were corrected for the primary particles considering the sandy texture of the MW. Moreover, partial aggregation was determined for each fraction and the mean weight diameter (MWD) of aggregates was computed. Soil bulk density and total porosity were also determined. No significant differences were observed in total aggregation and MWD among treatments including the control. For the size range of >4.75 mm, there were significant differences in aggregates > 4.75 mm between CR+MM in comparison with that for CT. There were also significant differences between MSW and PM+MM for the 1-0.425 mm fraction, and between CT and MM and CR for 0.425-0.162 mm aggregate size fractions. Therefore, CR-derived biochar applied with MM enhanced stability of macro-aggregates. Furthermore, soil bulk density was also the lowest bulk density and total porosity the highest for the CR-derived biochar treatment because macro aggregate stability is largely responsible for macro-porosity. The decrease in bulk density may be an indication of a positive effect for mine waste reclamation. Conversely, no differences were observed among treatments in micro-aggregate stability. Apparently, low organic matter contents in MW needed to be co-amended with labile organic amendments to effectively increase soil aggregation. Furthermore, the presence of Fe hydroxides could also increase the micro-aggregation. Additional research is needed to understand the mechanisms of mine soil reclamation.

Acknowledgement : This work has been funded by Fundación Séneca (Agency of Science and Technology of the Region of Murcia, Spain