

Final Report

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Title: The Effect of Biochar Application on Soil Microbial Ecology and Crop Growth

Applied Research Grant

Funded October 29, 2013

Completed September 30, 2014

Award amount: \$2472.00

Findings:

Our research investigated the use of biochar as a soil amendment to improve soil physical and chemical properties. We utilized four sources of biomass material, namely corn, woodchip, miscanthus, and horse manure overlaying pine shavings. The objective was to determine how differences in biomass source impacted the pyrolyzed product. We characterized the biochar materials using thermo gravimetric analysis (TGA); scanning electron microscopy (SEM); carbon, hydrogen, nitrogen, and sulfur (CHNS) analysis; inductively coupled plasma-optical emission spectroscopy (ICP-OES); fourier transformed infrared (FTIR) spectroscopy; and X-ray diffraction (XRD). Soils treated with biochar were analyzed using the methods above, in addition to pH, water holding capacity (WHC), and bulk density (BD) measurements. SEM imaging revealed significant structural differences among biochar produced from different biomass material. Percentage carbon and nitrogen were also significantly different across almost all biochar material. In addition the C & N content of the biochar materials were significantly higher than that of the biomass material from which they were produced. There were also differences in graphitic structure and calcite peaks among the different biochar as indicated by XRD analysis. Calcium and Mg concentrations also differed significantly among the different biochar products. Biochar treatment significantly lower bulk density of soils; with biochar produced from corn Stover having the lowest BD of all the treatments. Similarly, soils treated with corn biochar had significantly higher WHC compare to all the other biochar treatments. From our result we concluded that the type of biomass used to produce the biochar affects the properties of the biochar produced. Additionally, biochar produce from the biomass materials we used in our research tend to increase soil pH, WHC, and CEC; and simultaneously reduce soil compaction. However, additional research is required to investigate additional impact of biochar treatment on soil properties.

Presentations: Two graduate students working on the project presented the results from this project at three (3) conferences. *The Illinois Biochar Group Spring Meeting. March 2014; Celebration of Quality Symposium. Northwest Missouri State University. April 2014. Midwest Biochar Conference. August 2014.* Currently preparation of two manuscripts for publication is ongoing, anticipated submission date December 2014.

Expenditure:

Amount on Grant.....\$2472.00

Sample analysis at CIE.....\$1650.00

Chemicals & supplies.....\$822.00

Balance.....\$0.00

Shannon, Pamela. (Associate Professor of Music) "Solo Vocal Recital (Research)." Winter, Spring 2013.

My proposed research project was originally to prepare a new vocal recital program for performance on and off campus with the assistance of a vocal coach/accompanist. I was not approved for funding to prepare the recital with a vocal coach/accompanist, but was approved for the research portion into solo vocal recital repertoire.

My research took place at the Miller Nichols library on the campus of UMKC. I began by delving into many Bach cantata scores with arias for voice and obligato instrument as well as Handel arias from operas. I found a number of Bach and Handel arias that are not well-known and are excellent for students. I went on to research the much neglected Spanish repertoire for solo voice and found wonderful songs in this repertoire. The bulk of my research was done on songs by American composers. The research I did in this area has led to a paper: "Songs of the Second New England Composers Group" which has been accepted for presentation at the Fifty-Sixth National Conference of the College Music Society in Cambridge, MA (Oct 31-Nov.3, 2013). I am grateful to the Faculty Research Committee for funding my research.