Trace Elements in Soybean Plants Grown on Biochar Amended Soils In Northwest Missouri

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Introduction

- **Broad Description of Project**
  - Biochar to enhance crop production
  - Reduce Greenhouse Gases emission

- **Research Implications:- Soil**
  - Physical properties
  - Chemical properties
  - Biological properties
Introduction

- Influence of biochar on soil properties
  - Surface area & porosity,
    - Bulk density
  - Soil structure: Aggregation
  - Water holding capacity
  - Soil workability
Introduction

- **Chemical properties**
  - Cation exchange capacity
  - Higher sorption affinity.
  - Nutrient cycling
    - Increases nutrient availability for plant.

- **Biological properties**
  - Increases the soil microbial community’s diversity
Methodology
Soil and Biomass

- **Soil types (NW Missouri, Maryville)**
  - Sharpsburg Silty Clay Loam (Soil A)
  - Higginsville Silty Clay Loam (Soil B)

- **Type of Biomass**
Experimental Design

- **Biochar Production**
  - Max temp of 450 °C. (4hrs)
  - Starting at 100 °C. (Increasing with 50 °C /half hour)
Laboratory Analysis

- Biochar with soil
  - 2 g and 4 g carbon by 50 g of soil
Characterization

- Lab analysis
  - Carbon Hydrogen Nitrogen Sulphur and Oxygen (CHNS)
  - Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)
  - X-ray Diffraction (XRD)
  - Water Holding Capacity
  - Bulk Density
Equipment

- CHNS
- XRD
Equipment

- ICP-OES
Results
Scanning Electron Microscopy of Biochars
Soil Trace Element Concentration

Different letter indicates significant difference (a & b)
Bulk Density of Soils A

Different letter indicates significant difference (a, b & c)
Bulk Density of Soils B

![Bar graph showing the bulk density (BD) of soils under different biochar treatments. The graph indicates that control and PL have the highest BD, followed by HM, MS, WD, and CR, with CR having the lowest BD.](image-url)
Water Holding Capacity of Soil A

<table>
<thead>
<tr>
<th>Biochar Treatment</th>
<th>WHC %</th>
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<tbody>
<tr>
<td>CR</td>
<td>a</td>
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<td>MS</td>
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<td>PL</td>
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<tr>
<td>Control</td>
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Water Holding Capacity of Soil B

<table>
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<th>Biochar Treatment</th>
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<tr>
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Conclusion

- Soil treated with corn biochar had the best water holding capacity
- Soil B tended to have higher trace elements
- Soil treated with corn biochar also had the lowest bulk density
Future Work

- ICP for treated soils
- ICP for Plant tissues
  - Greenhouse
  - Field
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