Interactive Effects of Biochar and Fertilizer on the Growth of Potted Tomato Plants

Dee-Ann Wood, Jeff Chandler and Francis Lopez

Department Of Biological & Chemical Sciences, The University Of The West Indies, Cave Hill, Barbados
What is Biochar?

- The carbon-rich product of the pyrolysis of organic material (feedstock) such as wood, manure, crop residues, clippings etc.
  - properties affected by pyrolysis temperature and feedstock
- Created with the purpose of applying to soil to improve its agronomic character
- Can improve soil physical, chemical and biological properties due to porous nature
Benefits of Biochar

- Soil amendment
  - Improved water holding capacity
  - Improved drainage
  - Habitat for microorganisms
  - Increased surface area for nutrient adsorption

- Agricultural waste management

- Carbon sequestration

Objectives

• To determine the effects of biochar and fertilizer-infused biochar on plant growth and yield
• To investigate interactions between biochar and weekly fertilizer application

– Test Crop: Tomato (Solanum lycopersicum ‘HA3019’)
– Biochar was prepared from *Leucaena leucocephala* wood feedstock using low-tech drum technology
Methods

- Potted tomato plants 4L pots with 1:1 sand/soil potting mixture plus biochar
- 3 Biochar levels:
  - Control (no biochar)
  - Biochar (10% v/v, particle size: <2.5mm)
  - Fertilizer-infused biochar (Biochar +) infused with NPK (24:8:16, soaked for 24h in 1.5 g/L fertilizer solution)
- 3 weekly fertilizer levels: 0.75, 1.5, 2.25 g/L (NPK 24:8:16, Scotts Miracle-Gro, USA)
- Randomized block design (5 reps)
Control & Biochar pots

Leucaena leucocephala
http://ecflora.cavehill.uwi.edu/index.html
Leaf Water Potential Measured just Prior to Harvesting

**Biochar treatment**

- Control
- Biochar
- Biochar +

**Leaf water potential (bar)**

- 0
- -2
- -4
- -6
- -8
- -10

**Fertilizer level (g L⁻¹)**

- 0.5
- 1.0
- 1.5
- 2.0
- 2.5

**Fertilizer level**

- y = -1.19x - 6.66
- R² = 0.991, p = 0.06

**LSD**
Biochar and Fertilizer effects on Yield of Tomato (at 10 weeks)
Stem Dry Mass at Harvest

![Graph showing the effect of fertilizer g/L on stem dry mass g/plant for different treatments: Control, Biochar, Biochar +. The graph includes labeled points indicating significant differences: a, b, bc, c.](image)
Leaf Dry Mass at Harvest

Leaf dry mass g/plant

- Control
- Biochar
- Biochar +

Biochar Treatment

Significance levels:
- a
- b
Conclusions

• Pre-treatment of biochar with plant nutrients prior to soil application increased shoot dry mass but yields were not significantly affected.
• Further research efforts are needed to increase the partitioning of dry mass into fruit yields in biochar-amended soils.
• There is potential for the use of nutrient-infused biochar in tomato production.