Leveraging Organic Underutilized Resources & Urine-Based Fertigation for Circular Urban & Peri-Urban Crop Production

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Introduction

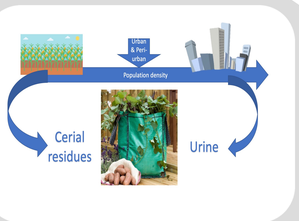
- Organic Underutilized Resources (OURS) and urine-based fertigation is hypothesized to support sustainable Urban and Peri-Urban (UPU) Crop Production.
  - *UPU- spaces within cities and surrounding regions.*
- We explored the utilization of human urine as a low-cost effective nitrogen fertilizer for crop production using high-carbon cereal residues (maize stover, wheat straw) and biochar.

Conclusion

- OURS combined with urine-fertigation systems holds great promise for UPU agriculture.
- Future directions: further exploration and optimization for other crops and substrates.

CIRCULAR ECONOMY FOR GREEN CITY SPACES

Research Design

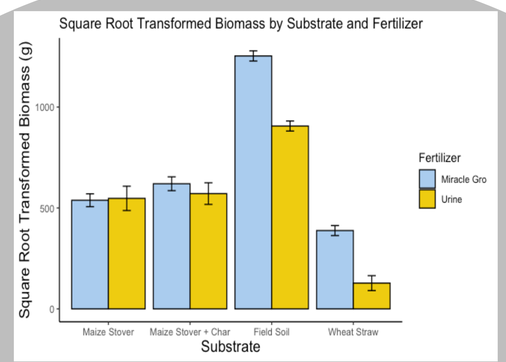


Urine	Synthetic Fertilizer (Miracle Gro® All-Purpose Plant Food)
Maize Stover	Maize Stover
Maize Stover + Biochar	Corn Stover + Biochar
Wheat Straw	Wheat Straw
Field Soil	Field Soil

Methodology

- **Plant growth conditions**: field experiment was conducted in the summer of 2023 in a high tunnel using kale as bioassay at Dilmun Hill Student Farm, Cornell University, Ithaca, New York. 72 30-gallon pots were laid out in a completely randomized design, with 4(+) replicates/treatment. Treatments compared 2 fertilizers (Urine vs. Miracle-Gro®) & 4 different substrates: Maize Stover, Maize Stover + Biochar, Wheat Straw Bales, and Field Soil. Non-soil (Organic Underutilized Resources(OURS)) experimental units underwent an initial conditioning with full-strength urine and concentrated Miracle Gro® for 1 month. Two 4-week-old dinosaur kale plants (Black Mamba) were transplanted into each unit. Units were fertigated once per week: urine at a rate of ⅛ dilution with water and Miracle Gro® mixed at the standard rate (24-8-16).
- **Growth measurements**: throughout the growing season, plant health (on a qualitative 0-3 scale) and leaf length were measured at multiple time points, and biomass was measured at the end of the season.

Results



- Urine fertilized units exhibited comparable performance to Miracle Gro® in terms of promoting plant growth and development