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A Biochar-Integrated Hydroponic Platform for Enhanced Microgreen Food Cultivation under Water-Limited Conditions

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INTRODUCTION & AIM

Drought stress limits soilless and urban farming. Hydrogels retain water but lack buffering capacity. Adding biochar offers a sustainable way to engineer resilient substrates.

In this study, biochars were produced from diverse biomass and incorporated them into phytagel hydrogels.

In the following, lettuce microgreen growth under drought conditions were invesitgated.

METHOD: Biochar Amendments

Phytagel

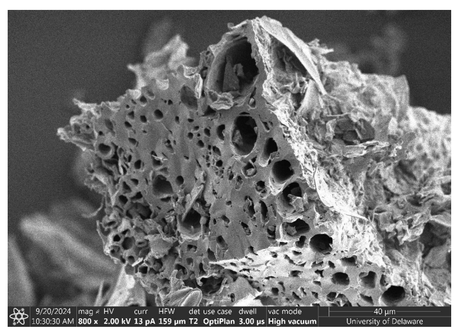
Biochar-amended Phytagel

METHOD: Biochar Preparations

Biochars were produced through pyrolysis or gasificatio of diverse biomass, including corn cobs, cocoa husks, nutshells, bamboo stalks, and poultry litters.

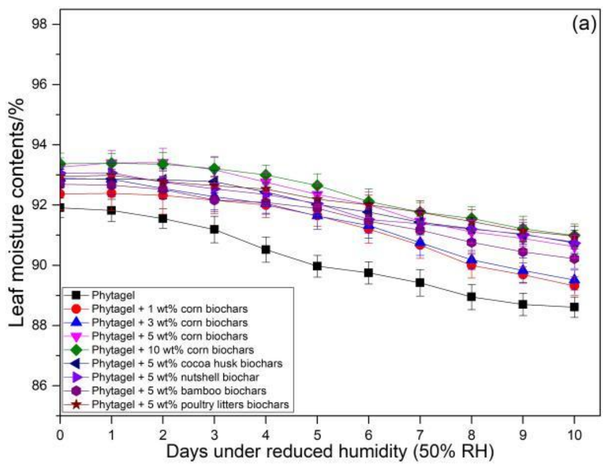
Feedstocks

Biochars

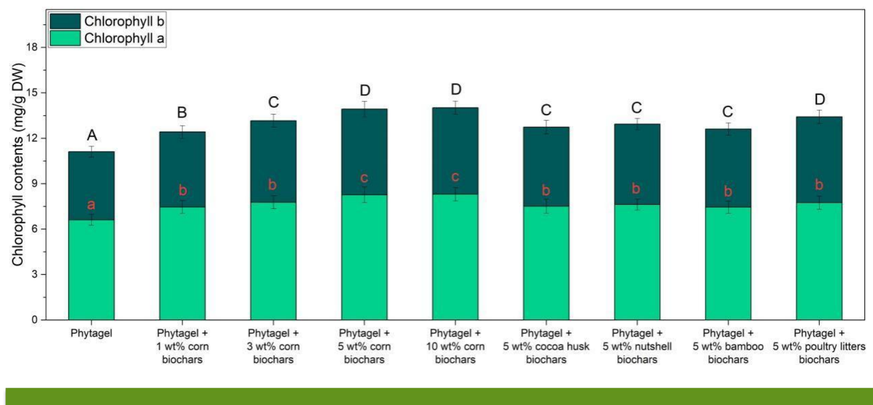


Porous structure of biochar

RESULTS & DISCUSSION



Leaf moisture and chlorophyll levels of lettuce microgreens grown in biochar-amended hydrogels were significantly higher than that grown in untreated controls.



CONCLUSION

Biochar-amended hydrogels improved water retention and boosted lettuce microgreen growth under drought. This sustainable approach supports resilient, water-efficient soilless farming.

FUTURE WORK / REFERENCES

Biochar–hydrogel systems will be advanced through microbial community studies trials, paving the way for resilient and scalable agriculture.

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