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Title	Evaluation of biochar as a filter medium in pre-treatment of water
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Evaluation of biochar as a filter medium in pre-treatment of water

Background

- Conventional biofilters (sand and compost) have limited effectiveness in removing bacteria¹.
- Biochar can remove hazardous substances and non-problematic dissolved organic matter¹.
- Biochar has to be tested if it can handle a complex mixture like stormwater².

Objective

- To study the effectiveness of biochar as a filter media relative to sand

Methodology

- Geomedia:

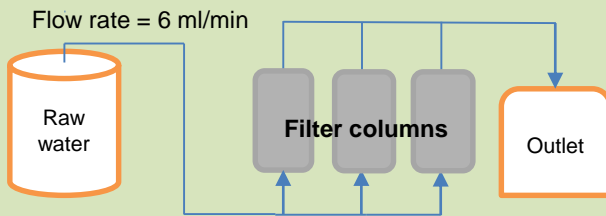


Fig 1: Experimental Setup. All 3 filter columns in a setup are filled with the same media. 3 setups, each filled with a different media, are conducted simultaneously.

Parameters

Microbiological

Bacteria (R2A), Fungi (PDA), Algae (RFU)

Water quality

Turbidity, pH, ORP, Cl⁻, NH₄⁺, NO₃⁻

References

- 1) Mohanty, S. K., & Boehm, A. B. (2014). Escherichia coli Removal in Biochar-Augmented Biofilter: Effect of Infiltration Rate, Initial Bacterial Concentration, Biochar Particle Size, and Presence of Compost. *Environmental science & technology*, 48(19), 11535-11542.
- 2) Mohanty, S. K., Cantrell, K. B., Nelson, K. L., & Boehm, A. B. (2014). Efficacy of biochar to remove Escherichia coli from stormwater under steady and intermittent flow. *Water research*, 61, 288-296.

Results

Microbiological

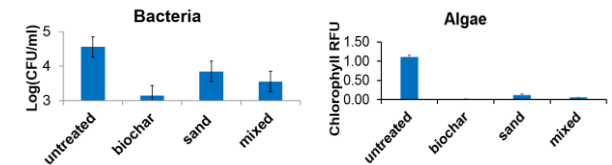


Fig 2: Bacteria and algae removal. Biochar (>96 and 99%); Sand (>81 and 89%); Mixed (>90 and 95%). No fungi detected in the raw untreated water.

Water quality

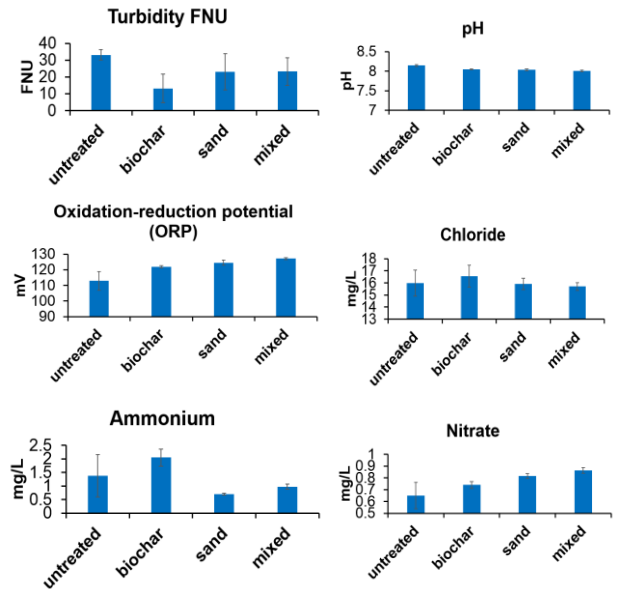


Fig 3: Changes in water quality. Reduction in turbidity - Biochar (40%), Sand (30%), Mixed(30%). No considerable changes in pH, ORP, Chloride, ammonium and nitrate.

Conclusion

-Biochar was the most effective filter medium compared to sand and mixed geomedia in improving bio-geo-chemical quality of water.

Future direction

-Other factors e.g. flow rate should be tested for their influence on removal efficiency.