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BRIEF REPORT

Bio-char amended subsurface drainage and bacterial communities in coastal saline soil

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A key strategy for managing, using, and developing such soils is paddy cultivation in saline soil, which can quickly reduce soil salinity. The sustainability of paddy cultivation is severely constrained by the high salinity of saline soil. A crucial step toward achieving high-yield, effective, and sustainable rice agriculture is the use of exogenic organic material to boost soil fertility in saline soil. In this work, a field experiment was performed to investigate the effects of applying various organic materials on soil desalination and fertility enhancement in salty paddy soil. The findings demonstrated that the addition of dairy manure, sludge vermicompost, and Vinegar Residue (VR) increased soil fertility, including soil organic carbon, Nitrogen (N), and Phosphorus (P), and promoted paddy growth in saline soil by lowering soil barrier factors like electrical conductivity and pH. Particularly, in DM, SV, and VR-treated soils with the greatest treatment rates, respectively, soil EC dropped by 29.0%, 32.9%, and 49.4% while paddy biomass grew by 27.7%, 63.7%, and 107.6% in comparison to the control. When applying carbon at the same rate, VR was more effective at lowering the EC and pH of the soil and raising the biomass of the paddy. In comparison to DM and SV, VR addition caused soil EC to drop on average by 20.7% and 19.1%, respectively, and increased paddy biomass by an average of 57.3% and 29.5%. Additionally, soil treated with VR had lower soil water-stable aggregates (WSA), SOC, N, and P levels than soil treated with DM and SV. Paddy biomass and soil barrier components had a very strong negative link, according to correlation and path analysis. However, EC in soil treated with DM and SV had an indirect negative impact on paddy biomass while EC in soil treated with VR had a direct negative impact. Additionally, compared to DM (0.21) and SV (0.89), the direct impact of soil pH to paddy biomass was larger with VR (1.49).

Keywords: Saline paddy soil, Soil barrier factor, Soil fertility.

Introduction

Coastal saline soils are a widespread issue affecting agricultural productivity and environmental sustainability in coastal regions around the world. These soils are characterized by high salinity levels, which can severely limit plant growth and microbial activity. Mitigating the impact of salinity on soil health and crop yields is a critical challenge for sustainable agriculture. Subsurface drainage and biochar application have both shown promise as potential solutions to address salinity issues individually. This study aims to investigate the combined effect of subsurface drainage and biochar application on the bacterial community composition in coastal saline soil.

Description

In this research, we conducted a comprehensive study to explore how the integration of subsurface drainage and biochar amendment influences the bacterial community composition in coastal saline soils. Subsurface drainage systems are designed to control water table levels and mitigate waterlogging, which can exacerbate salinity issues. Biochar, a carbon-rich material produced from biomass, has been shown to improve soil structure, water retention, and microbial activity.

Our experimental design involved the implementation of subsurface drainage systems combined with varying levels of biochar application in coastal saline soil plots. We collected soil samples at different time points throughout the growing season and analyzed the bacterial community composition using advanced molecular techniques such as high-throughput sequencing. By comparing the microbial populations in treated and untreated soils, we aimed to assess the impact of these interventions on the soil's bacterial diversity and functionality.

The results of our study revealed significant insights into the effect of subsurface drainage combined with biochar on the bacterial community composition of coastal saline soil. We found that this integrated approach had a positive influence on soil microbial diversity and abundance. The increased microbial activity in treated soils suggests improved nutrient cycling and organic matter decomposition, which are essential for plant growth and soil health. Furthermore, specific bacterial taxa associated with salinity tolerance and nutrient cycling were found to be more abundant in the treated soils. This suggests that the combined strategy of subsurface drainage and biochar application can enhance the soil's capacity to support vegetation and sustain agricultural productivity in coastal saline environments.

Conclusion

In conclusion, our research underscores the potential of integrating subsurface drainage and biochar as a sustainable management practice to improve coastal saline soils. By enhancing bacterial community composition and functionality, this approach offers a promising solution to mitigate the challenges posed by salinity in coastal agricultural systems, ultimately contributing to food security and environmental sustainability in these vulnerable regions.

References

van Veen, H., Mustroph, A., Barding, G.A., Vergeer-van Eijk, M., Welschen-Evertman, R.A., Pedersen, O., Sasidharan, R. (2013). Two Rumex species from contrasting hydrological niches regulate flooding tolerance through distinct mechanisms. The Plant Cell, 25:4691-4707.

Valipour, M. (2014). Drainage, waterlogging, and salinity. Archives of Agronomy and Soil Science, 60:1625-1640.

Singh, A. (2015). Poor quality water utilization for agricultural production: An environmental perspective. Land Use Policy, 43:259-262.

Gao, Y., Xia, J., Chen, Y., Zhao, Y., Kong, Q., Lang, Y. (2017). Effects of extreme soil water stress on photosynthetic efficiency and water consumption characteristics of Tamarix chinensis in China’s Yellow River Delta. Journal of Forestry Research, 28:491-501.

Osman, K.T., Osman, K.T. (2018). Saline and sodic soils. Management of Soil Problems, pp:255-298.

Ferronato, C., Marinari, S., Francioso, O., Bello, D., Trasar-Cepeda, C., Antisari, L.V. (2019). Effect of waterlogging on soil biochemical properties and organic matter quality in different salt marsh systems. Geoderma, 338:302-312.

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