Effects of Woodchip Biochar on Soil Greenhouse Gas Emissions

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Introduction

- Soil organic carbon is a key factor in reducing climate change and improving soil fertility [2].
- Commercial fertilizers provide soil with the necessary nutrients, but are increasing soil greenhouse gas emissions [1].
- Biochar is a renewable resource that poses as a good alternative to commercial fertilizers and promotes plant growth, while reducing soil greenhouse gas emissions [1].

Experimental Methods

Soil collection
(Grey luvisol from Breton plots)

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Soil processing
(Air dried and sieved)

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Soil packing for incubation
(Bulk density: 1.2 g cm^{-3})

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Maintaining 50% water field pore space

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Incubation at 22 °C ± 3 °C

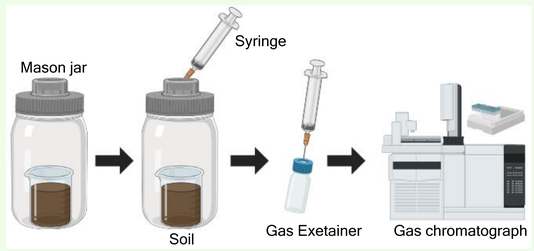

Figure 1.0 Gas collection from mason jars containing soil and fertilizer at time intervals (0h and 24h) and analysis through gas chromatograph

Results

Treatment	Nitrogen (% wt)	Sulfur (% wt)	Carbon (% wt)
Ammonium sulphate	21	24	-
Urea	46	0	-
Woodchip biochar	19	15.5	18.7

Table 1: Nutrient composition of soil amendments used in this study (P_2O_5 & K_2O: NIL)

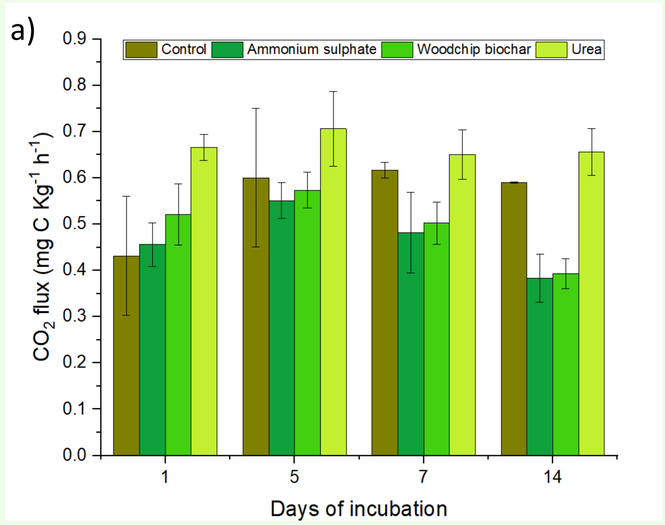

Figure 2.0 Effect of soil amendments (ammonium sulphate, woodchip biochar and urea) on a) Carbon dioxide (CO_2) and b) Nitrous oxide (N_2O) flux during incubation

Conclusion

- Woodchip biochar had higher carbon content and comparable nitrogen content compared to commercial fertilizers.
- Carbon dioxide and nitrous oxide flux of woodchip biochar was lower than urea but slightly higher than ammonium sulphate.
- With increase in incubation time, the carbon dioxide flux of woodchip biochar considerably decreased compared to control (no amendments).
- Woodchip biochar can be a good alternative for improving soil organic carbon and nitrogen, while controlling greenhouse gas emissions.
- The experiment will be carried on for the next 3 months to get a better idea on greenhouse emissions and the soil fertility will be tested.

Citations

[1] Pokharel, P., Kwak, J. H., Ok, Y. S., & Chang, S. X. (2018). Pine sawdust biochar reduces GHG emission by decreasing microbial and enzyme activities in forest and grassland soils in a laboratory experiment. Science of the Total Environment, 625, 1247-1256.

[2] Pokharel, P., & Chang, S. X. (2019). Manure pellet, woodchip and their biochars differently affect wheat yield and carbon dioxide emission from bulk and rhizosphere soils. Science of the Total Environment, 659, 463-472.

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