Potential of biochar and crop residues for enhancing CH_4 uptake in fertilized soils

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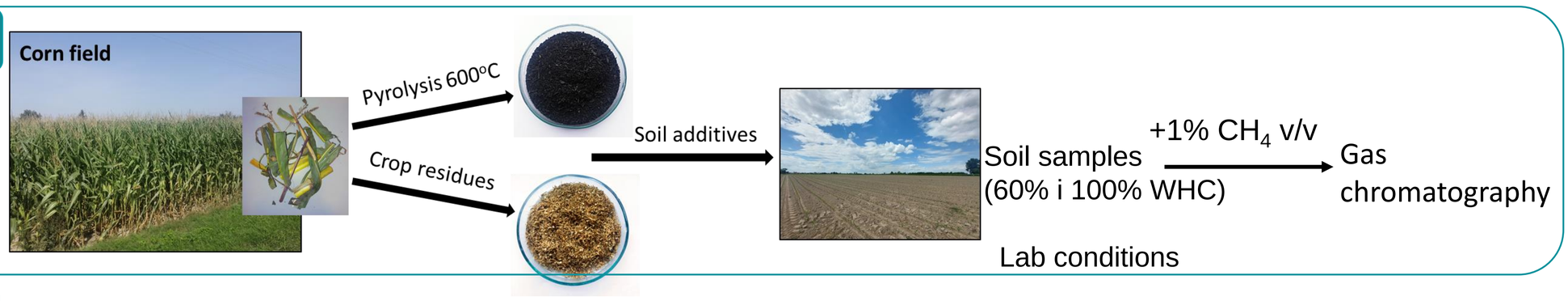
RATIONALE

- ✓ Methane (CH_4) is one of the key greenhouse gases that can be taken up by soils through oxidation by methanotrophs.
- ✓ Methanotrophy is often reduced in fertilized soils hence the need to look for practices that stimulate CH_4 uptake.
- ✓ Biochar application to soils shows potential for improving GHGs balance and soil properties.
- ✓ Crop residues left on the field are a source of fertilizer, humus and also prevent water loss from the soil.
- ✓ It is important to determine the impact of both biochar application and crop residues on soil methanotrophy.

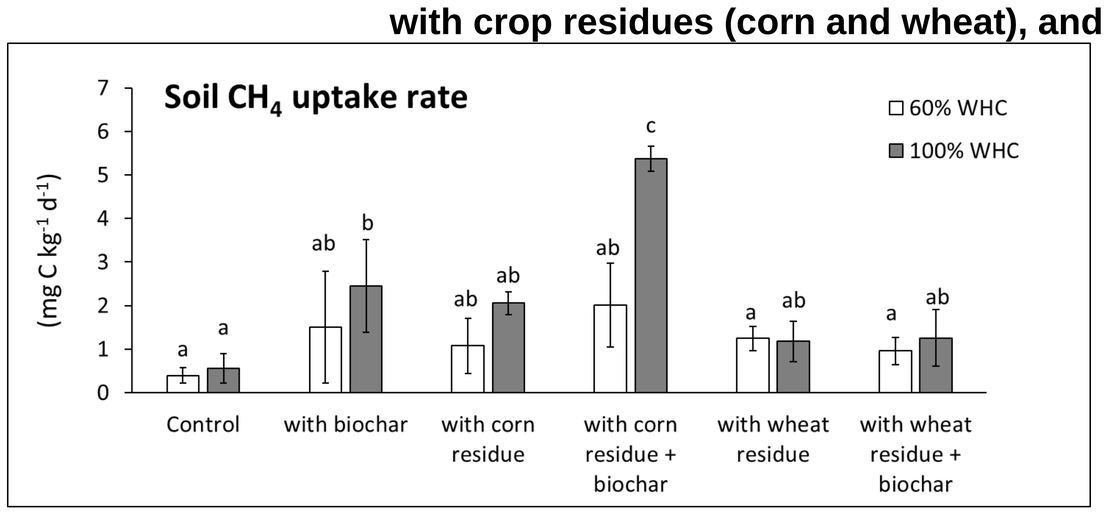
The aim of the study was to assess the effect of biochar (produced from maize), crop residues (maize and wheat), and a mixture of these amendments to mineral-fertilized soil in relation to CH_4 uptake and CO_2 emissions.

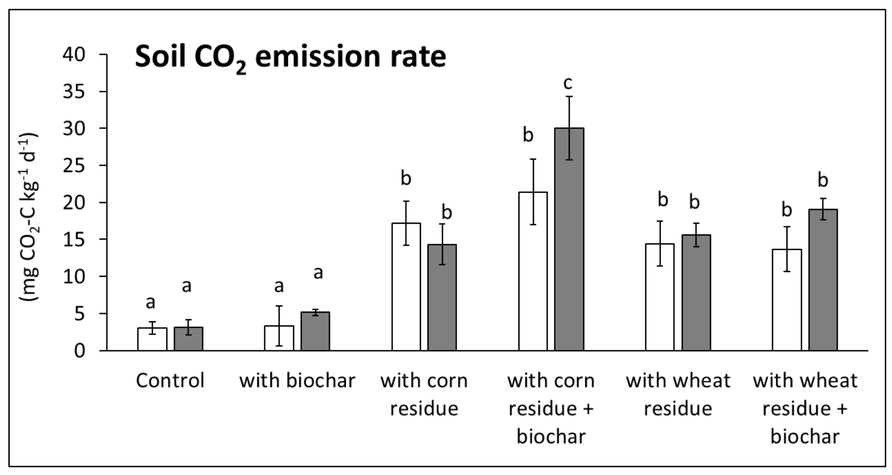
METHODS



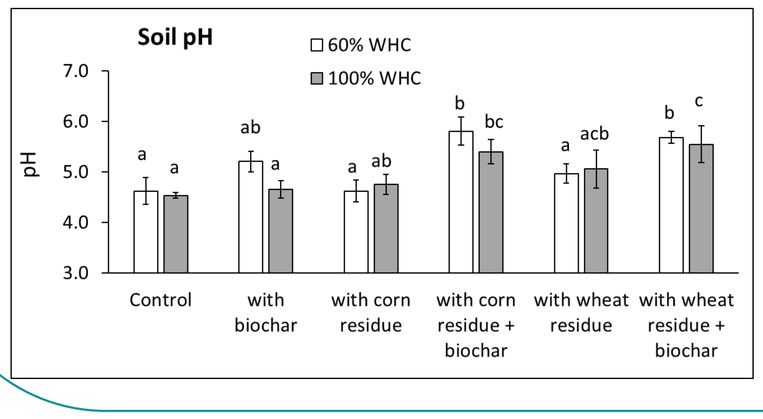
RESULTS

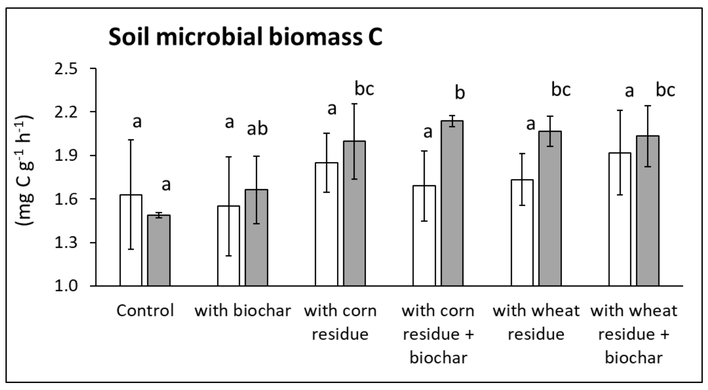
CH_4 uptake and CO_2 emission rates in fertilized soil without any additives (control), with biochar, with crop residues (corn and wheat), and with the mixture of biochar and crop resides

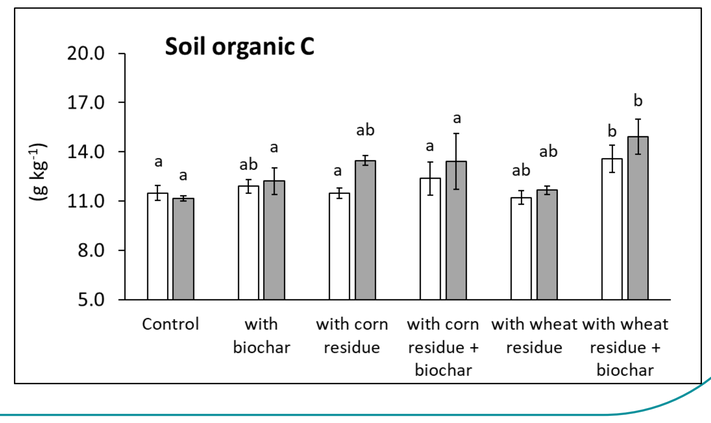




Soil pH, microbial biomass C and organic C concentrations after incubations







SUMMARY AND CONCLUSIONS

- ✓ The separate addition of biochar or crop residues did not significantly influence the rate of CH_4 oxidation in the tested soil.
- ✓ The addition of a mixture of biochar and corn residues signifficantly increased the rate of CH_4 uptake and CO_2 emission under saturated conditions.
- ✓ The applied additives with crop residues have significantly increased soil CO_2 emissions in both moisture contents.
- ✓ Soil pH was signifficantly higher after application of the mixture of biochar and crop residues, regardless soil moisture level.
- ✓ Soil microbial biomass C signifficantly increased after enrichment with crop residues alone and in mixture with biochar under saturated conditions.
- ✓ The content of soil organic C was signifficantly higher in variant with the mixture of wheat residue and biochar, regardless soil moisture.
- ✓ Statistical analysis showed that soil pH and microbial biomass C significantly ($p<0.05$) and positively influenced CO_2 emissions under saturated conditons.
- ✓ In the context of improving methanotrophy, it is worth considering the mixture biochar and crop resideus application especially in saturated soils.

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