

Effect of organic carbon and nitrogen addition on the emission of nitrous oxide in aggregates from straw-incorporated soil

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Abstract

Vegetable field is one of the important sources of N₂O emission. Effect of exogenous organic carbon and nitrogen input on the N₂O emissions in different sizes of soil aggregates collected from protected field with/without corn straw incorporation was investigated using Robot incubation system. The result showed that the N₂O production was not increased in all particle sizes of straw-treated soil aggregates. Exogenous organic carbon and nitrogen addition significantly increased the N₂O production in soil aggregates from protected field.

Keywords: straw incorporation, soil aggregates, protected field, nitrous oxide, carbon and nitrogen input

1. Introduction

The response of soil N₂O emission to carbon and nitrogen input is still unclearly known. The characteristics of N₂O emission from soil aggregates is useful to understand the mechanism (Wang et al., 2018).

2. Materials and methods

N₂O emissions in soil aggregates with different sizes (>2, 1-2, 0.25-1 and <0.25 mm) from protected field with/without six-year corn straw incorporation were investigated with incubation experiment. Soil aggregates were treated with CK, 100 mg N kg⁻¹ ammonium sulfate (AS) and AS+100 mg C kg⁻¹ glucose (AS+Glu), respectively. The concentration of N₂O was monitored using a robotized incubation system (Molstad et al., 2007) under aerobic conditions with 20 °C and 25 % soil mass water content for 200 hours.

3. Results

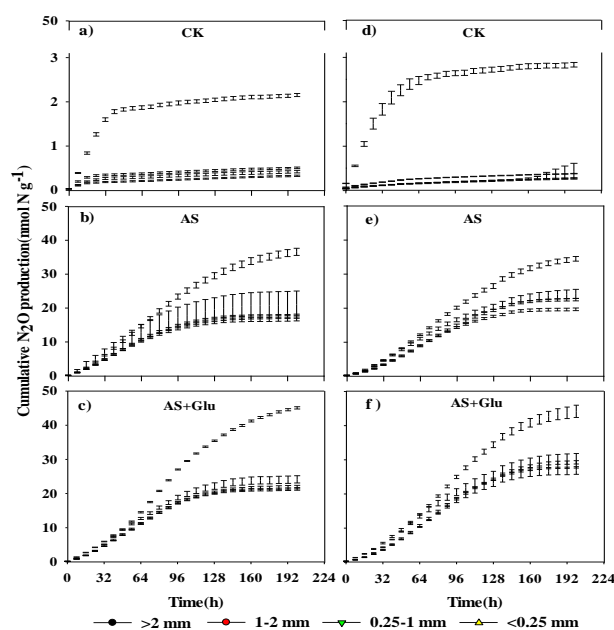


Fig. 1: Cumulative N₂O production from two soils (without straw (a, b, c) and with straw (d, e, f)) and different sizes aggregates (>2, 1-2, 0.25-1 and <0.25 mm) with exogenous organic carbon and nitrogen input.

The N₂O production in all aggregates from both soils was significantly increased after adding AS or AS+Glu ($P < 0.05$). In the control treatment, straw incorporation could not stimulate the N₂O production of soil aggregates with >2 mm and 0.25-1 mm, except for soil aggregates with <0.25 mm. Straw incorporation stimulated N₂O production in the soil aggregates with the size of 1-2 mm and 0.25-1 mm ($P < 0.05$) under AS or AS+Glu treatment.

4. Conclusion

Exogenous organic carbon and nitrogen significantly increased the N₂O production in soil aggregates. N₂O production was not increased in all sizes of straw-treated soil aggregates.

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References

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