Effects of brackish water on the mineralisation of peat soils

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Introduction

Peatlands and associated shallow waters are important in the NW Netherlands. Climate change in peatlands involves higher temperatures, drier summers and salinisation of groundwater and surface water. Higher temperatures lead to increased mineralisation of peat, resulting in extra soil subsidence, GHG emission and deterioration of surface water quality. Drier summers increase the demand for extra water supply to maintain the water table sufficiently high to prevent desiccation and reduce oxidation of peat. In extreme cases, not sufficient fresh water is available and the supplied water is slightly brackish. In addition, groundwater salinisation takes place when brackish groundwater surfaces.
The effects of salinisation on peat mineralisation rates are still unknown.

Research question

What is the effect of salinisation on C, N and P decomposition of *Sphagnum* and *Carex* peat samples extracted from the anaerobic and aerobic layers of agricultural peat soils and peatland nature reserves?

Hypotheses

- In aerobic and/or NO_3 -rich soils: no effect or retarding mineralisation
- In anaerobic and NO_3 -poor soils: after adaptation, mineralisation can be enhanced because of the addition of SO_4 (electron acceptor).

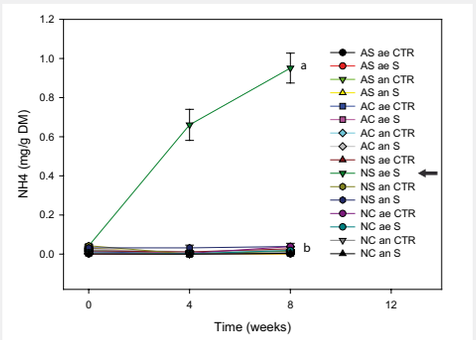
Method

Sphagnum and *Carex* peat samples of anaerobic and aerobic layers of agricultural areas and nature reserves were incubated for 0, 4, 8 and 16 weeks. Pore water was extracted, and added to the samples up to 60% WHC for aerobic samples and 100% WHC for anaerobic samples. Half of the samples received pore water with added salt (2000 mg Cl/L; natural salt mixture containing chloride and sulphate salts). A previous experiment with 800 mg Cl/L resulted in no significant differences between brackish and non-brackish samples.
Demineralised water-extractable NO_3, NH_4, PO_4, DOC and soluble phenolics were determined at 0, 4, 8 and 16 weeks. CO_2 en CH_4 were determined more often.
Repeated Measures ANOVA was performed on the data.
Preliminary results of soil extractions of t0, t4 and t8 are presented on this poster.

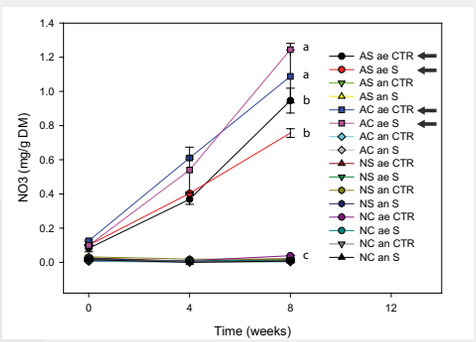
Results & discussion

Salinisation stimulates NH_4 accumulation in aerobic *Sphagnum* from a nature reserve. Does the low pH in combination with salt hamper nitrification and/or stimulate ammonification?
Coupling of ammonification and nitrification in aerobic agricultural soils.
Results still to be analysed (in progress):

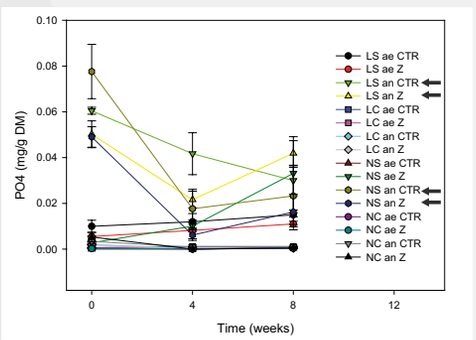
- NO_3, NH_4, DOC, PO_4 at time 16
- gas emissions
- soluble phenolics



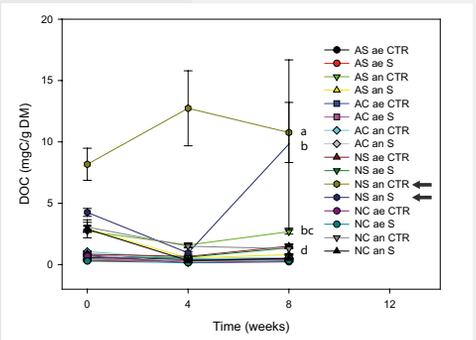
◄ ***Figure 1:*** **Extractable NH_4. NH_4 accumulation was found in brackish aerobic *Sphagnum* from a nature reserve. For abbreviations see table.**



◄ ***Figure 2:*** **Extractable NO_3. Aerobic agricultural soils show increasing NO_3 concentrations. Other soils show negligible NO_3 concentrations. No salt effect is detected. For abbreviations see table.**



◄ ***Figure 3:*** **Extractable PO_4. Anaerobic *Sphagnum* soils show highest concentrations. There is no salt effect. Statistics not represented. For abbreviations see table.**



◄ ***Figure 4:*** **Extractable DOC. DOC concentrations are low, except for anaerobic *Sphagnum* samples from a nature reserve without salt addition, effect of salt on this peat type is not yet clear. For abbreviations see table.**

Table 1: **Abbreviations used in figures 1-4.**

Land use	Peat type	Layer	Treatment
A: Agriculture	C: Carex	An: Anaerobic	CTR: No salt
N: Nature	S: Sphagnum	Ae: Aerobic	S: Salt addition

Conclusion

No effect of salinisation on C, N and P mineralisation of aerobic and anaerobic *Sphagnum* and *Carex* peat samples from both agricultural areas and nature reserves on mineralisation rates was found.
An exception to this is aerobic *Sphagnum* peat from a natural area, here NH_4 accumulated, however, (severe) salinisation is not likely to occur in this area.
A decisive answer on the effect of salinisation on de C, N and P mineralisation of peat can be given when all results are analysed.