Effects of salinization on perennial ryegrass under consideration of fertilization with a natural soil conditioner

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Background and research question

Low laying coastal areas in East Frisia, Germany, are important pasture and meadow areas for livestock production. Salinization processes can affect local grasses in their growth and production, however little knowledge on the phenomenon is available. We tested the influence of different salt concentrations on the development and yield of perennial ryegrass (*Lolium perenne*) with and without addition of the natural fertilizer *Hoorn-Power* which contains mainly seaweed (*Fucus vesiculosus*). The aim of the study was to determine the effects of different salt concentrations on aboveground-biomass production, rootstock and sprout development and whether the addition of *Hoorn-Power* could alleviate the symptoms.

Methods

Experimental Design

- 264 planting pots with a volume of 3L are filled with soil, the natural fertilizer *Hoorn-Power* made from seaweed (*Fucus vesiculosus)* and other natural ingredients is added to half of them (132).
- The pots are distributed on 4 tables, alternating rows with and without fertilizer addition (Fig. 1).
- A mixture of local grass for extensive grazing containing 3 types of *Lolium perenne* that reach maturity at different times is applied to the pots (1.3g of seeds each).
- The grass is cut several times during the 6-month duration of the experiment (Fig. 2), the biomass is weighed (Fig. 3). Rootstock and sprout development of one pot per table are evaluated (Fig. 4, 5 & 6). The soil is analyzed at the end of the growth period.

Fig. 1: Experimental design

Fig. 2: Growth comparison shortly after cutting: left: fertilizer addition, right: no fertilizer

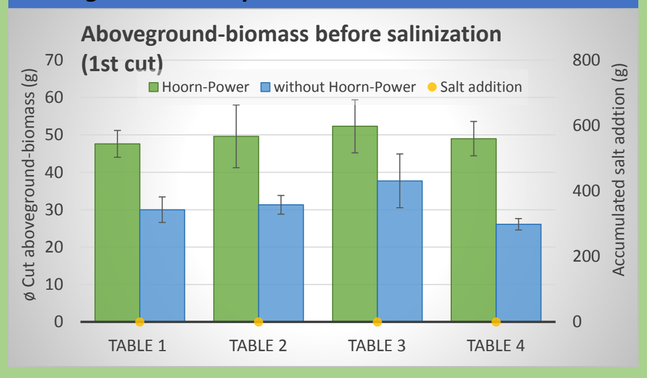
Salinization

To represent the naturally occuring salinization through seepage, salt (NaCl) was added stepwise with irrigation water after the first grass cut in different concentrations on the tables:

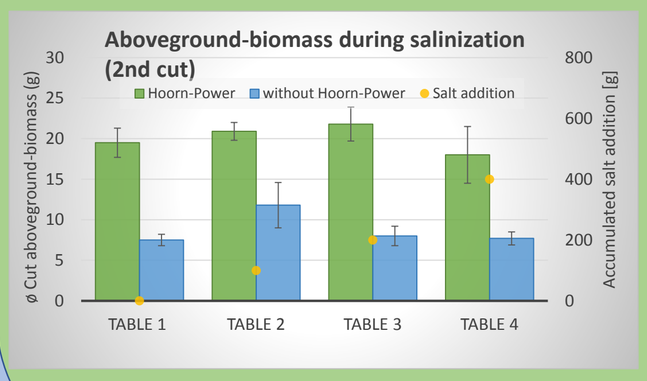
Table 1	no salt added
Table 2	low salt addition
Table 3	moderate salt addition
Table 4	high salt addition

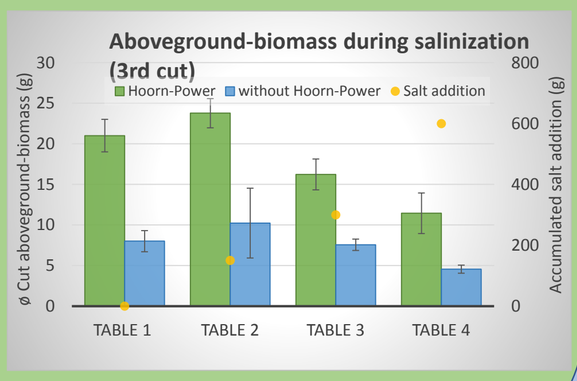
Results – Aboveground biomass production

Fig. 3: Biomass production across treatments



- The grass was cut after 7, 14 and 21 weeks at a height of 1,5 cm.
- The biomass was separated between treatments.
- Preliminary results show differences between treatments with and without fertilizer and first effects of salinization on biomass prodution.
- Experiment is still ongoing, analysis of soil pending..

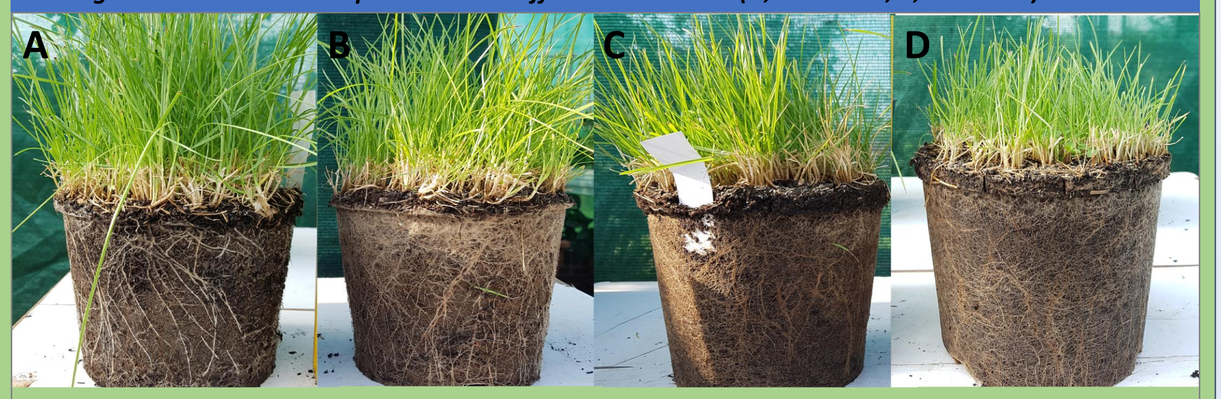




Results – Comparison of rootstocks

A comparison of rootstock and sprout numbers per root between pots from table 1 (no salt) and table 4 (highest salt content) showed that both treatments - the addition of the fertilizer *Hoorn-Power* and the addition of salt - influenced the development of the plants.

Fig. 4 – Rootstock development under different conditions (A,B: table 1, C,D: table 4)



A: *Hoorn-Power* addition, no salt

B: no fertilizer, no salt

C: *Hoorn-Power* addition, salt addition

D: no fertilizer, salt addition

Fig. 5: Number of sprouts per root (s)

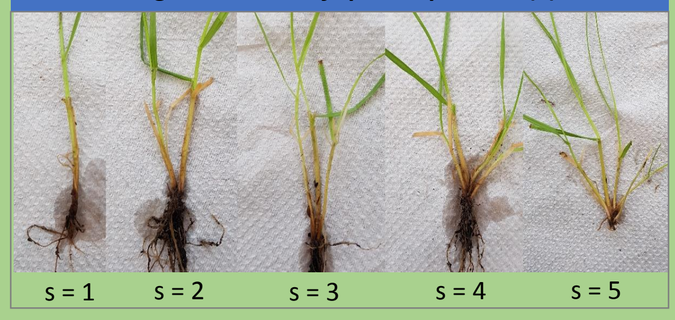
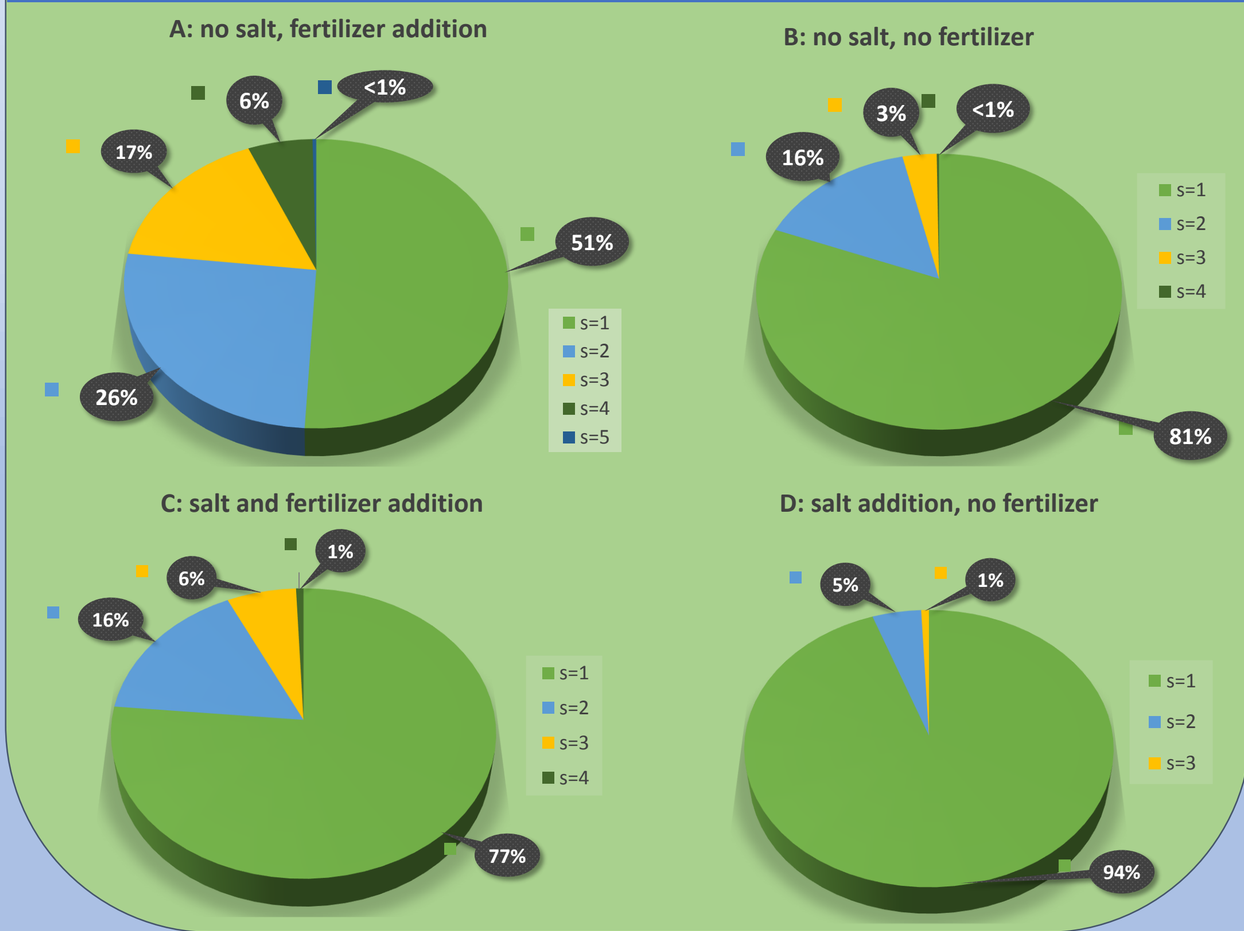


Fig. 6 – Distribution of number of sprouts per root (s) under four treatment combinations



Discussion and conclusions

- Our preliminary results indicate a positive and strong effect of the natural fertilizer and soil conditioner *Hoorn-Power* on growth, root and sprout development and general vitality of the tested pasture and meadow grass *Lolium perenne*. Aboveground-biomass production and the number of sprouts per root was increased in the pots treated with *Hoorn-Power*.
- The addition of salt resulted in weaker roots, less sprouts per root and less biomass production at higher salt concentrations in comparison to non-saline conditions. However, these symptoms could partly be alleviated by the treatment with *Hoorn-Power*.
- A possible explanation could be an increased soil fertility induced by *Hoorn-Power* making the soil more resistant to the effects of general stressors such as salinization.
- Allthough further research is needed, our results could help to develop methods to mitigate decreasing yields in grassland areas under threat of salinization.