

Growth development of selected paludicultures in mesocosms

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INTRODUCTION

Lower Saxony is one of the moor-rich federal states in Germany. About 90% of the moor area is drained and used for agriculture, forestry or peat cutting. Almost 5 million tons of CO₂ equivalents are emitted annually from drained fen soils; this corresponds to almost 5% of the total greenhouse gas balance (MU 2016). Paludiculture is the agricultural or forestry use of wet and rewetted peatlands and other organic soils that reduces greenhouse gas emissions and the loss of the peat body. The biomass from paludicrops is suitable for further processing into a variety of products. As part of a joint project (Products from paludiculture biomass) in Lower Saxony one objective is to collect data on the cultivation and establishment of selected paludicultures cattail (*Typha latifolia*, *Typha angustifolia*), reed (*Phragmites australis*), and canary grass (*Phalaris arundinacea*). We hypothesize that, for a given species, regardless of the number of plants per qm at the beginning of the experiment (1, 3 or 6) the same number of shoots per qm will be reached over time.

MATERIAL AND METHODS

On 6th august 2020, the mesocosms (1000 litre container filled with fen peat) were planted with the paludicultures *T. angustifolia*, *T. latifolia*, *P. australis*, and *P. arundinacea*. Three plant densities (one, three, and six plants per 1.2m²) were implemented in triplicate repetition (Fig. 1). Water levels were maintained at 5 - 10cm above soil surface (*T. angustifolia*, *T. latifolia*, *P. australis*) or at soil surface level (*P. arundinacea*). Number of shoots, plant height, and flower development were determined for each plant. Senescence as well as the yield determination were carried out per container. So far, only *Typha angustifolia* has been harvested (25/10/2020) and dry biomass yield determined.

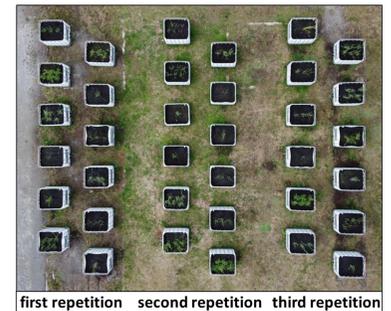


Fig. 1: Design of the experiment with 36 mesocosms with three plant densities and four paludicrops

PRELIMINARY RESULTS

Influence of plant density on shoot development

By 10/22/2020 (72 days after planting), *Phragmites australis*, *Typha angustifolia*, and *Phalaris arundinacea* showed similar shoot development regardless of plant density. In contrast, plant density had a significant effect on shoot development of *Typha latifolia*. Number of shoots per plant was higher in the container with 1 plant than with 3 or 6 plants (Fig. 2).

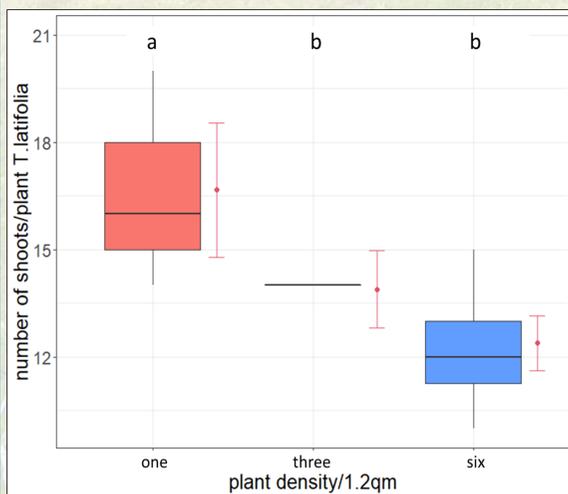


Fig. 2: Shoot development per plant by 10/22/2020 (day 72 after planting) of *Typha latifolia* depending on plant density (Tukey test, $p \leq 0.05$)

Influence of plant density on plant height development

Up to 10/15/2020 (65 days after planting), the development of the plant height of *Typha angustifolia*, *Phragmites australis* as well as *Phalaris arundinacea* proceeded without a detectable influence by plant density. Only plant height of *Typha latifolia* were significantly affected by plant density. Plant height per plant was higher in the container with 6 plants than with 1 or 3 plants (Fig. 3).

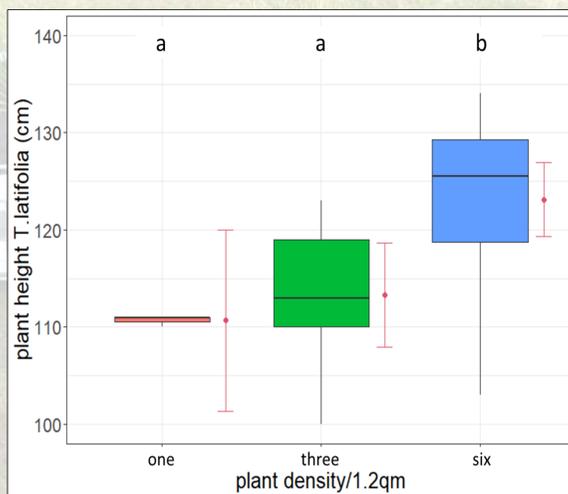


Fig. 3: Plant height development per plant up to 10/15/2020 (day 65 after planting) of *Typha latifolia* depending on plant density (Tukey test, $p \leq 0.05$)

Influence of plant density on biomass yield

Typha angustifolia showed an increase in dry biomass yields with increasing plant density. The dry biomass yields of the containers with 3 and 6 plants were equivalent and significantly higher compared to the containers with 1 plant (Fig. 4). The similarly development of shoot number and plant height per plant across all plant densities expected a more noticeable difference in yield.

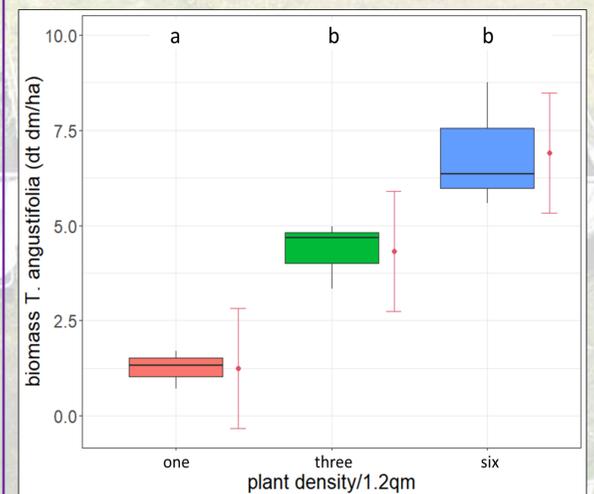


Fig. 4: Dry biomass yields of *Typha angustifolia* depending on plant density (Tukey test, $p \leq 0.05$)

CONCLUSION

In the first year (2020), plant density just influenced the plant development of cattail species. The greater development of shoots per plant in single planting than in multiple planting indicates greater proliferation of *Typha latifolia* compared to the other paludiculture species. For *Typha angustifolia*, no biomass increase was observed by increasing plant density from 3 to 6 plants/1.2qm. To answer our hypothesis, further investigations are still necessary.

Literature

Niedersächsisches Ministerium für Umwelt, Energie, Bauen und Klimaschutz (MU) 2016: Programm Niedersächsische Moorlandschaften - Grundlagen, Ziele, Umsetzung