PLECO
Plants and Ecosystems
University of Antwerp

Three-dimensional soil heterogeneity modulates the responses of plant community to drought in experimental mesocosms

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Introduction

Experimental design

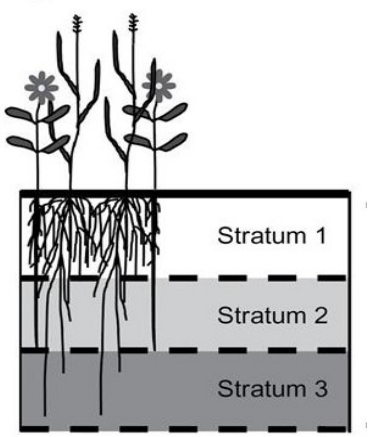
Results

Conclusion

Introduction

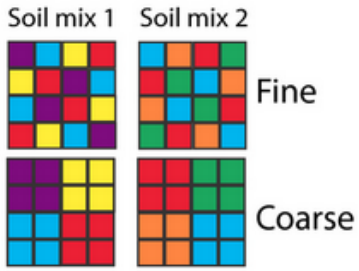
1. Soil heterogeneity (SH); complicated nature
2. Gaps in SH research
    1. Two dimesions
    2. Special species
3. Gaps in SH and climate change interaction
    1. Elevated CO_2, N enrichment, rainfall
    2. Drought
4. Aims

Introduction



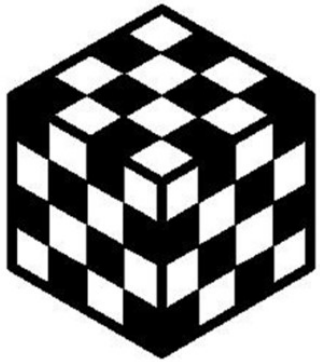
Williams and Houseman (2014) J Plant Ecol

Heterogeneous soil

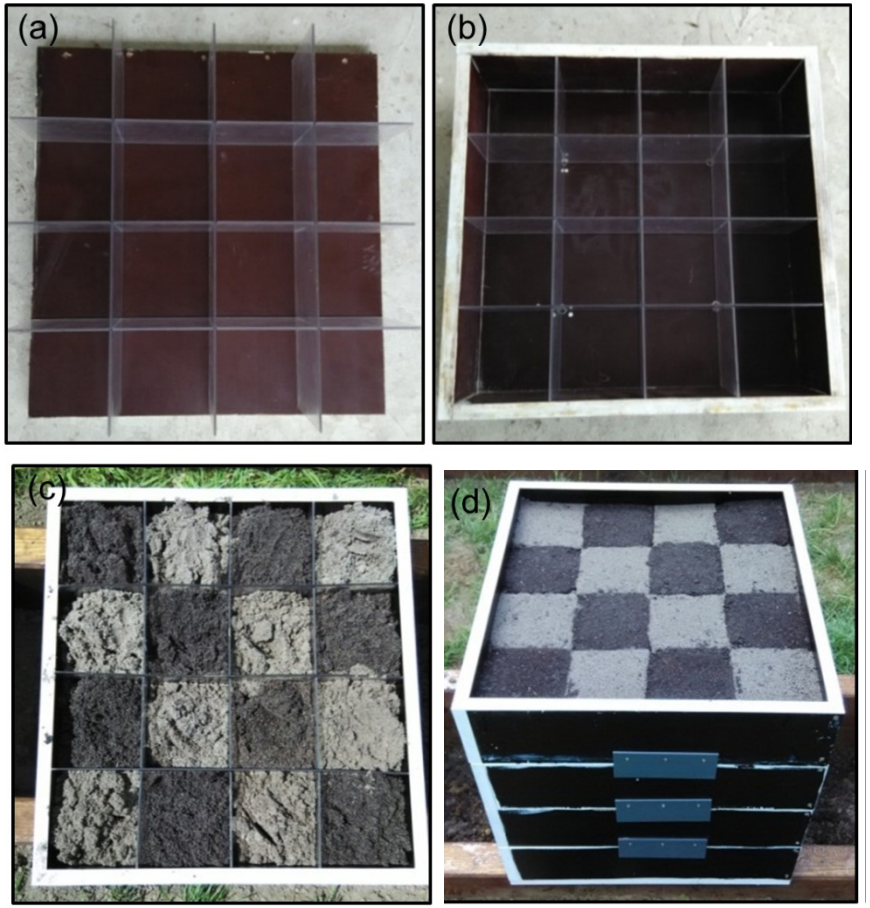


Wubs and Bezemer (2016) J Ecol

Three-dimensional soil heterogeneity



Introduction



Liu et al. (2017) Ecol Res

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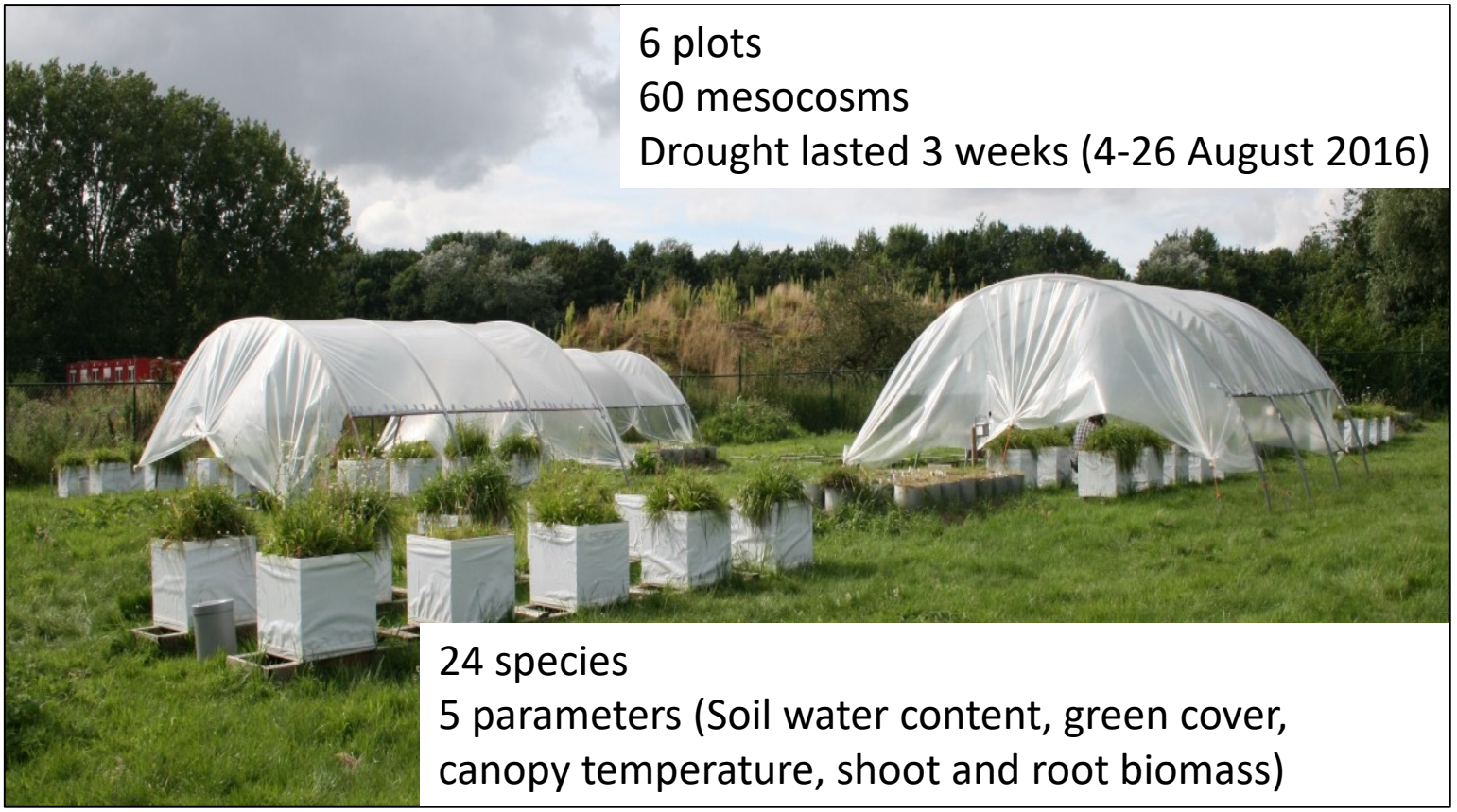
Experimental design

Cell size 0 cm Cell size 12 cm Cell size 24 cm Cell size 48 cm

high low

Soil heterogeneity

Experimental design



6 plots
60 mesocosms
Drought lasted 3 weeks (4-26 August 2016)

24 species
5 parameters (Soil water content, green cover, canopy temperature, shoot and root biomass)

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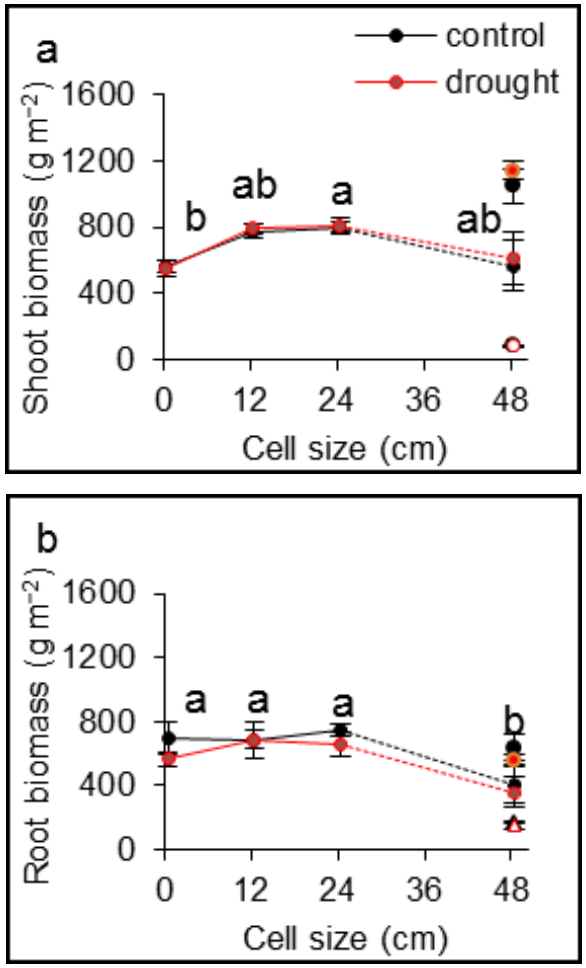
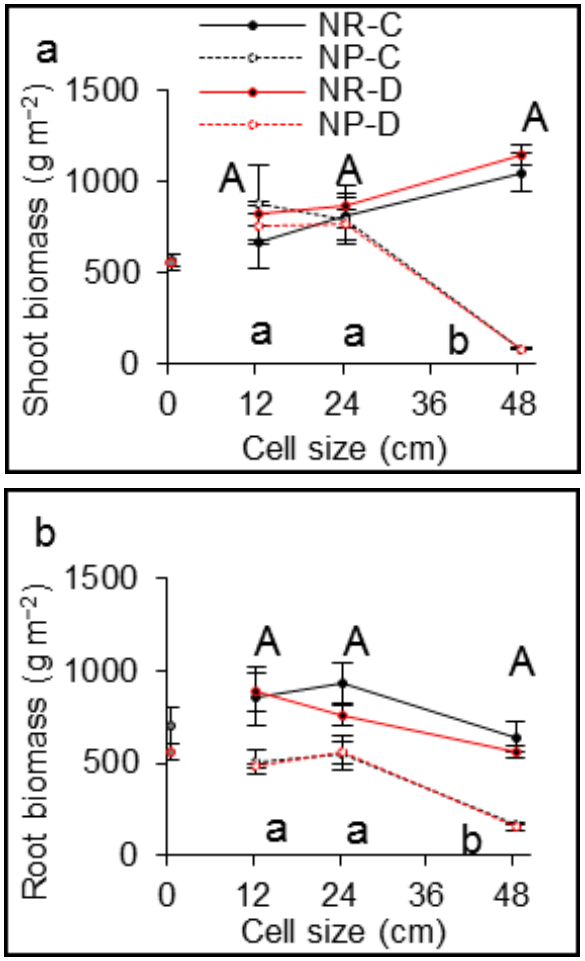
Biomass (at mesocosm scale)



a. Shoot biomass tends to follow a unimodal curve, where more biomass in intermediate SH

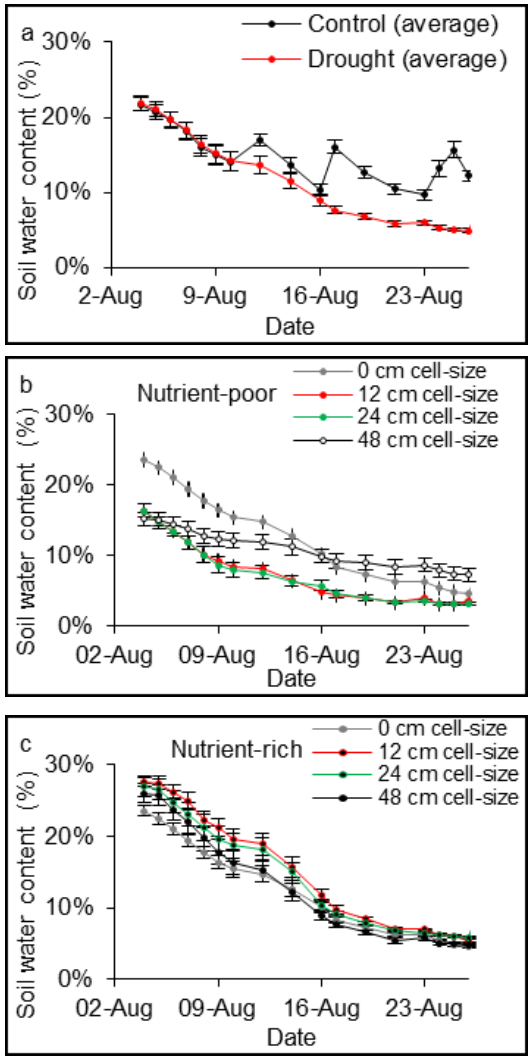
b. Higher root biomass was found at higher and intermediate SH

Biomass (at patch scale)



a. On nutrient-rich patch: shoot and root biomass was similar among levels of SH
b. On nutrient-poor patch: shoot and root biomass increased with increasing SH

Soil water content

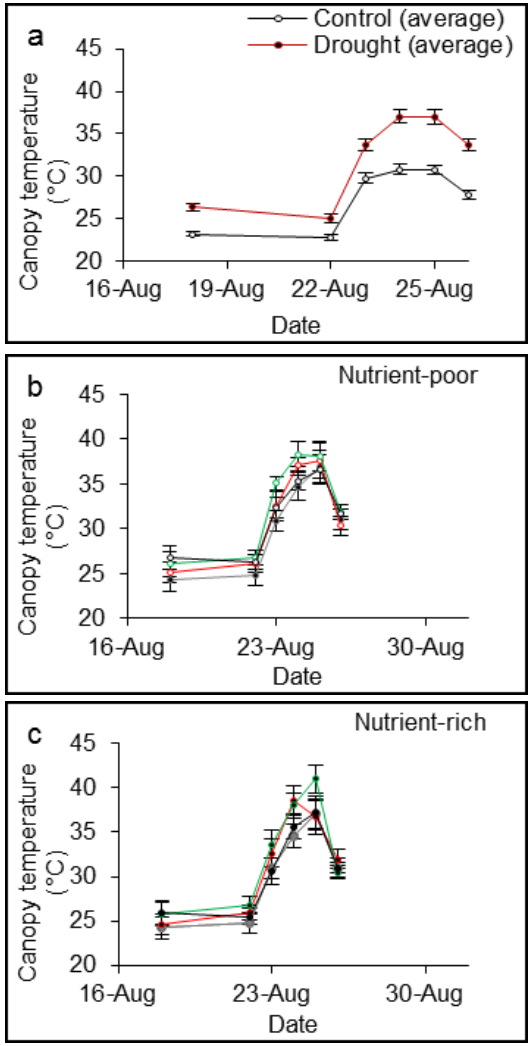


a. Drought did affect soil water content (SWC)

b. On nutrient-poor patch, SWC in 48-cm-mesocosms decreased more slowly than the others

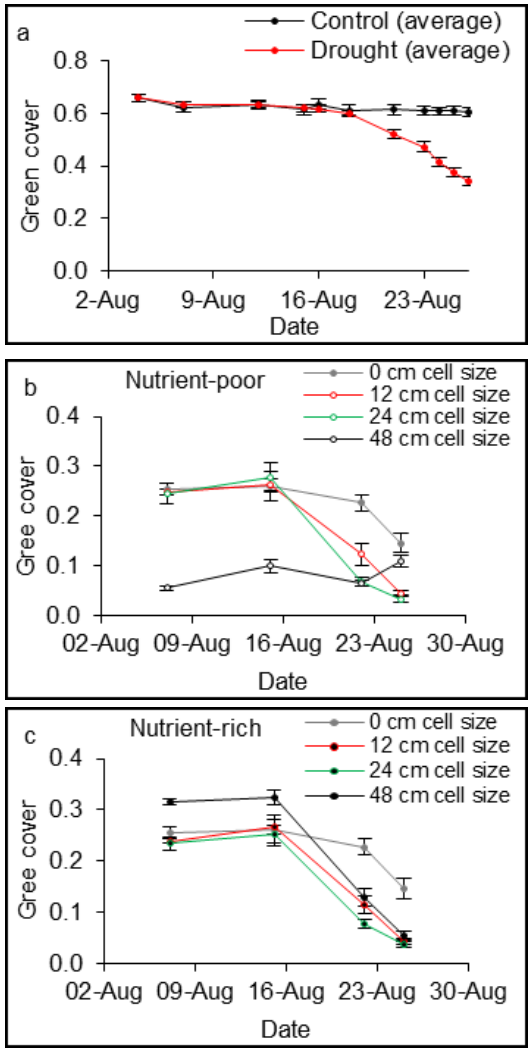
c. On nutrient-rich patch, SWC in mesocosms decreased at a similar rate

Canopy temperature



a. Drought did affect canopy temperature
b. On nutrient-poor substrate, canopy temperature in 48-cm-mesocosms increased more slowly than the others
c. Similarly, on nutrient-rich substrate

Green cover



a. Drought did affect green cover
b. On nutrient-poor patch, green cover in 48-cm-mesocosms decreased more slowly than the others
c. On nutrient-rich patch, green cover in mesocosms decreased at a similar rate

Conclusion

1. Soil heterogeneity affected shoot biomass and root biomass, where intermediate heterogeity enhances biomass
2. Drought affeced SWC, canopy temperature and green cover, but not biomass
3. The interaction of soil heterogeneity and drought affected SWC and green cover, but not the others
4. Soil heterogeneity modulates the effect of drought

Acknowledgements

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