WAGENINGEN
UNIVERSITY & RESEARCH

Growth responses of conifers to climate; the underlying functional mechanisms.

Yanjun Song, Frank Sterck, Lourens Poorter
Forest Ecology and Forest Management Group, Wageningen University & Research, PO Box 47, 6700 AA Wageningen, the Netherlands

INTRODUCTION

1. Conifers often dominate in forests under relatively harsh (cold or dry) habitats. Their unique morphological features allow them to be successful in these stressful habitats.

2. We aim at explaining how conifers climatic growth responses are driven by underlying functional traits and their original habitat.

3. We test hypotheses on the species growth potential and growth sensitivity to shading, drought and cold (see Table 1).

METHODS

Site: We study ~50 y-old trees from 26 conifer tree species grown in a common garden experiment near Putten, the Netherlands (Fig.1)

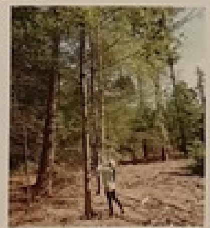


Fig. 1 Samples collection in Schovenhorst Estate.

Functional traits (Table. 1)

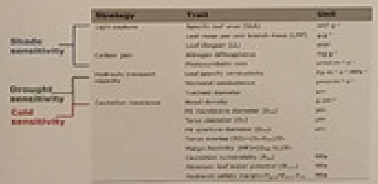


Table. 1 18 functional traits and their corresponding strategy.

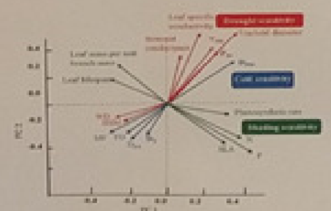


Fig. 2 Predictions for the 18 functional traits in a PCA plot. The " red" traits explain drought sensitivity, the blue cold sensitivity and the green shade sensitivity.

SOME RESULTS ON DROUGHT SENSITIVITY

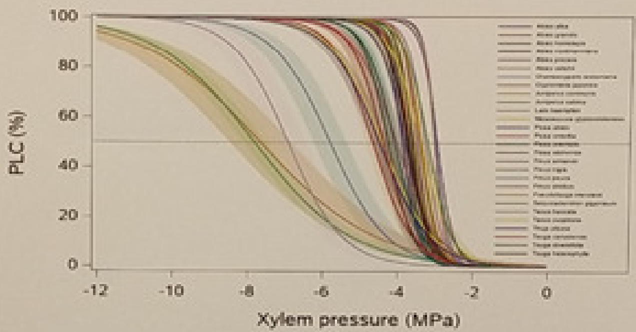


Fig. 3 Vulnerable curve for 26 conifer species which show the loss of conductivity with twig dehydration, measured by the xylem pressure.

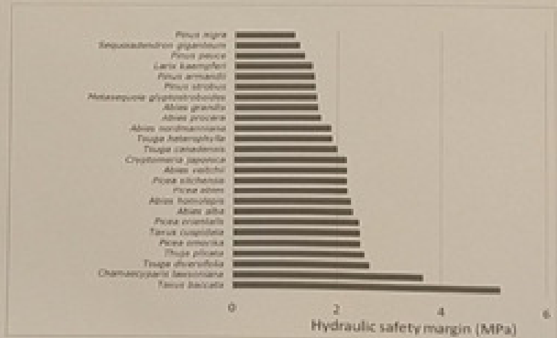


Fig. 4 Hydraulic safety margin for 26 conifer species. Here it is defined as the difference minimum water potential observed in the leaf and P_{50} (water potential at which 50% stem conductivity is lost).

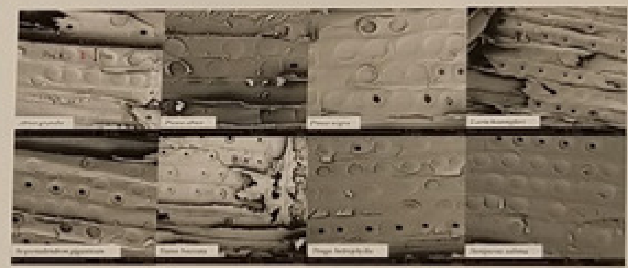


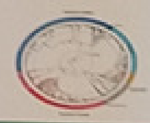
Fig. 5 Anatomy of the torus-margo membrane for 8 different genera species. D_{PM}, pit membrane diameter; D_T, torus diameter; D_{PA}, pit aperture. These features link to drought sensitivity.

CONCLUSIONS

Many species show similar trends in drought sensitivity, but *Taxus baccata*, *Chamaecyparis lawsoniana*, *Juniperus communis* and *Juniperus sabina* are less sensitive than the others.

FUTHER WORK

1. Finish all traits collection and test all hypothesis.
2. Show growth responses in tree rings to climate variation over the past decades to quantify growth potential and growth sensitivity.
3. Show how habitat and phylogeny determine growth and underlying functional traits.



ACKNOWLEDGEMENTS

We thank Ute Sass-Klaassen, Leo Goudzwaard, Angelina Horsting and Qi Liu for data collection. We also thank Sylvain Delzon, who provided support with the measurement for P50 and anatomical structure. This project is funded by Wageningen University (LEB fonds 2018-051C Song), also supported by Schovenhorst.