# **Tree Growth Responses to the 2018-2020 Drought: Roles of Drought-Tolerance Traits and Functional Dissimilarity to the Tree Neighbourhood**

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TreeDì 🚒

## INTRODUCTION





stomatal control

#### Part 2

**Can functional** dissimilarity between the focal tree and it's neighbourhood support growth during drought?



## RESULTS



- Trait Syndromes related to hydraulic safety and stomatal control are clear drivers of tree growth responses
- Having a safer hydraulic system becomes beneficial for a trees' growth during drought
- Having a higher stomatal control is a disadvantage during normal conditions, but becomes even beneficial during drought
- Neighbourhood tree species



monocultures of the MyDiv experiment.

richness modulates the relationship between the trees' growth and its functional identity

Part 2

A focal trees' functional dissimilarity to its neighbouring trees becomes beneficial during drought years







Functional Dissimilarity of the Focal Tree and its Tree Neighbourhood

(regarding PC2 traits)

- Trees with distinct hydraulic safety traits compared to their neighbors grow more during drought
- Trees with stomatal control traits distinct from their neighbors show much stronger growth during drought

Fig. 5: Focal trees' growth (as Basal Area Increment) predicted by its functional dissimilarity (in terms of (a) all drought-tolerance traits, (b) only PC1 traits, (c) only PC2 traits) to its neighbouring trees.

### METHODS

- Site: tree diversity experiment in Germany (MyDiv)
- Using annual growth data (2015-2021) of 5,120 tree individuals
- measured 13 functional leaf and branch traits related to drought tolerance and resource use of 10 broad-leaved tree species in MyDiv

<ul> <li>Morphologica</li> <li>Stomata den</li> <li>Stomata size</li> <li>Specific Leaf</li> <li>Leaf Dry Mat</li> </ul>	<b>al traits (leaf)</b> sity Area ter Content
	<ul> <li>Physiological traits</li> <li>Stomatal conductance (mean during drought; residual conductance)</li> </ul>
<b>Xylem anatomical</b> <b>traits (branch)</b> - Vessel density	<ul> <li>Water potential (Ψmin; ΔΨ; hydroscape area)</li> <li>Embolism resistance (P50)</li> </ul>
<ul><li>Vessel size</li><li>Wood density</li></ul>	

- Using a focal tree's functional identity (PCA scores) and the species richness of its neighbourhood...
- Using a focal tree's dissimilarity to its neighbourhood... ...for modeling tree

growth during drought

#### CONCLUSION

- A trees' functional identity plays a crucial role under drought, as traits that are less advantageous in normal conditions can become beneficial during drought.
- A tree grows better under drought conditions if it is functionally more different from its neighbour trees.



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