

WEAK COORDINATION BETWEEN LEAF DROUGHT TOLERANCE AND PROXY TRAITS

IN HERBACEOUS PLANTS

MARIA MÁJEKOVÁ^{1,2}, Tomáš Hájek^{3,4}, Agnes J. Albert⁴,
 Francesco de Bello^{3,5}, Jiří Doležal^{3,4}, Lars Götzenberger^{3,4},
 Štěpán Janeček⁶, Jan Lepš³, Pierre Liancourt^{1,4}, Ondřej Mudrák⁴

¹ University of Tübingen, Germany; ² Comenius University, Slovakia;
³ University of South Bohemia, Czechia;
⁴ Czech Academy of Sciences, Czechia;
⁵ CIDE-CSIC, Spain; ⁶ Charles University, Czechia

CONTACT
 maria.majekova@uni-tuebingen.de



STUDY SYSTEM

- Central European temperate grasslands
- 122 species - forbs and graminoids

PROXY TRAITS

- = easy to measure morphological traits often used as proxies of drought tolerance in plants
- Specific leaf area, Leaf dry matter content
- Leaf area, Leaf thickness
- Plant height
- Intrinsic water use efficiency ($\delta^{13}C$)

TURGOR LOSS POINT

- = a hydraulic trait
- more negative \rightarrow sucking water from drier soils \rightarrow desiccation tolerance
- less negative \rightarrow close stomata early while cells are still hydrated \rightarrow desiccation avoidance



RATIONALE

Increased drought is predicted to have a major impact on plant performance under environmental change

- Yet leaf hydraulic traits directly related to drought tolerance, such as leaf turgor loss point, are
- underrepresented in trait-based studies and
- have been largely overlooked within the main frameworks evaluating trait-trait coordination:
 - the leaf economics spectrum and
 - the global spectrum of plant form and function



TAKE HOME MESSAGE

We emphasize the need for direct measurements of leaf hydraulics when estimating plant drought responses to better understand and predict species responses to environmental change

TAKE HOME MESSAGE

Measuring turgor loss point is easy

- Large sample size friendly
- Field and greenhouse friendly
- Cheap (once you find somebody with the osmometer, but samples can be transported)
- User friendly (actual measurement requires a pipette and take exactly 90 sec per sample)



In the field you just need a portable cooler



Leaf samples need to be rehydrated, but you can be creative - for example here we used wine cellar as an ideal dark and cool environment to rehydrate the samples overnight



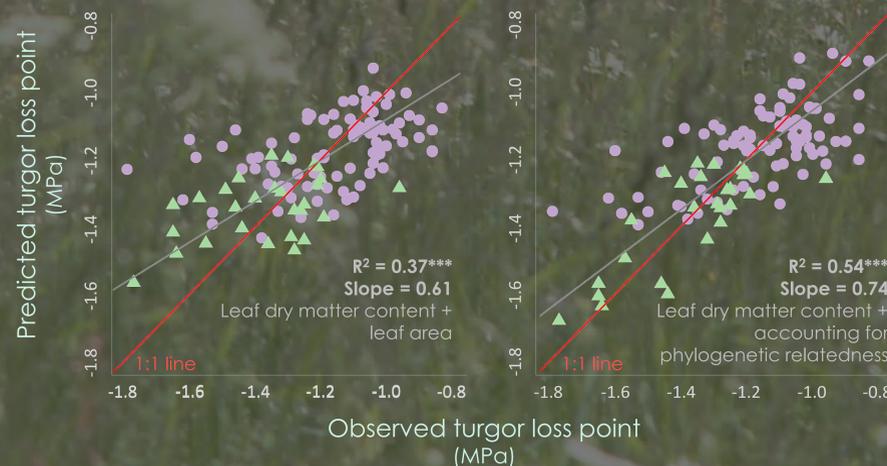
Turgor loss point does not need to be measured in the field. Syringes serve as easy air-tight storage containers - frozen can wait months until there is time to measure the turgor loss point.

QUESTION 2

CAN SINGLE OR MULTIPLE TRAITS PROVIDE GOOD PREDICTION OF TURGOR LOSS POINT?

CONCLUSION 2

The proxy traits considered here, alone or combined, did not provide a strong prediction of turgor loss point.



QUESTION 1

IS THERE COORDINATION BETWEEN TURGOR LOSS POINT AND TRAITS OFTEN USED AS PROXIES FOR DROUGHT TOLERANCE?

CONCLUSION 1

Relatively weak coordination between leaf drought tolerance (turgor loss point) and proxy traits representing key dimensions of the leaf economics spectrum and the global spectrum of plant form and function.

