



HAL
open science

Drying without dying: do potted saplings of *Fagus sylvatica* design more resistant branches in response to gradual soil drought?

Tete Severien T. S. Barigah, Olivia O. Charrier, Stéphane Herbette, Thierry Ameglio, Hervé H. Cochard

► To cite this version:

Tete Severien T. S. Barigah, Olivia O. Charrier, Stéphane Herbette, Thierry Ameglio, Hervé H. Cochard. Drying without dying: do potted saplings of *Fagus sylvatica* design more resistant branches in response to gradual soil drought?. ACCAE - 2010 "Adapting to climate change: agriculture and ecosystems", Oct 2010, Clermont-Ferrand, France. pp.23-24. hal-00964749

HAL Id: hal-00964749

<https://hal.science/hal-00964749>

Submitted on 3 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Drying without dying: do potted saplings of *Fagus sylvatica* design more resistant branches in response to gradual soil drought?

Barigah TS¹, Charrier O², Herbette S², Améglio T¹ and Cochard H¹

¹INRA, UMR547 PIAF, F-63100 Clermont-Ferrand, France ; ²Université Blaise Pascal, UMR547 PIAF, F-63177 Aubière, France
tete.barigah@clermont.inra.fr

Introduction

Currently, drought year is reported to occur about once every ten years in much of Europe (Rust and Savill 2000). We investigated how the wide spread forest tree *F. sylvatica* will respond to the predicted drier and warmer climate for the coming decades (IPCC 2001). Our goals were to (1) test and interpret sapling response of beech to gradual soil moisture depletion, (2) check whether xylem dysfunction leads to plant mortality, and (3) check whether alive trees adjusted hydraulic features in newly produced shoots after the release from water shortage.

Material and methods

The experiment was conducted at Crouël, Clermont-Ferrand, France (N 45°77', E 3°14'; altitude of 300 m). We used:



potted beech saplings (153) under greenhouse growth conditions



a TDR, time domain reflectometer for a survey of the soil water status



a pressure bomb to assess xylem water potentials (Ψ_x)

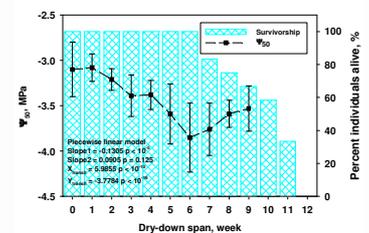
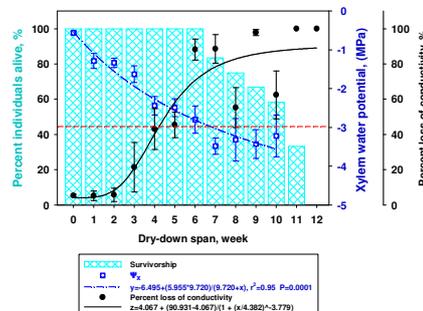
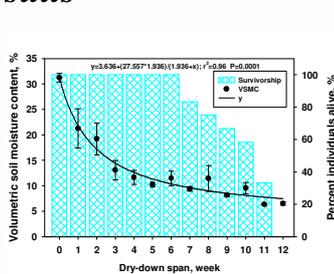


a xylem embolism meter to measure the shoot PLC, percent loss of conductance



a customized centrifuge 'Cavitron' to assess for shoots the water potential that induced 50% loss of conductance (Ψ_{50})

Results



We assessed the percent individuals alive budburst (i.e. at the onset of 2009 growing season) and found that beech saplings can withstand more than 2 months without any watering. Xylem water potential decreased steeply over the 6 first weeks and levelled off by week 7 following the water shortage. A progressive decrease in individuals primed when Ψ_x got lower than -3 MPa. Meanwhile a consistent increase in PLC was observed. A threshold of -3 MPa looked to be critical for the survivorship of the saplings. Along with the severity of the water stress the plants were subjected to during 2008 growing season, the Ψ_{50} decreased progressively until an inflection point occurred. Our results showed that hydraulic features were critical for beech tree survivorship in extreme drought conditions.

References

IPCC 2001. Climate change 2001: Impacts, adaptation and vulnerability. In: J. McCarthy, O. Canziani, N. Leary, D. Dokken, K. White eds. Contribution of working group ii to the third assessment report of the intergovernmental panel on climate change (ipcc). Cambridge, UK: Cambridge University Press, Cambridge, UK.
Rust, S. and P.S. Savill 2000. The root system of *Fraxinus excelsior* and *Fagus sylvatica* and their competitive relationships. *Forestry*, 73:499-508.

UMR Physiologie Intégrée de l'Arbre Fruitier et Forestier – Inra/Université Blaise Pascal