Plasticity in plant hydraulic traits: do we know what is going on?

M. Mencuccini, J. Martinez-Vilalta, Cochard, Sylvain Delzon, B. Choat

XIV MEDECOS & XIII AEET meeting

Human driven scenarios for evolutionary and ecological changes

Abstract book

31st January - 4th February 2017
Seville, Spain

XIV MEDECOS &
XIII AEET meeting

AEET
ASOCIACIÓN ESPAÑOLA
DE ECOLOGÍA TERRESTRE

Estación Biológica Doñana CSIC

EXCELENCIA SEVERO OCHOA

UNIVERSIDAD DE SEVILLA

Abstract book of the XIV MEDECOS & XIII AEET meeting,
Seville, Spain, 31st January - 4th February 2017

Doi.: 10.7818/MEDECOSandAEETCongress.2017

Editorial deadline: 20th December, 2016.

Publisher: Asociación Española de Ecología Terrestre (AEET)
C/ Tulipán s/n, 28399, Móstoles, Madrid, Spain

Layout: Imprenta Sand, S.L. Seville. Spain.

S.06-27-Poster

Deciphering the ecophysiological traits involved during water stress acclimation and recovery of the threatened wild carnation, Dianthus inoxianus

López-Jurado, J.[1], Balao, F.[2], Mateos-Naranjo, E.[3]

(1) Faculty of Biology, University of Seville. (2) Faculty of Biology, University of Seville. (3) Faculty of Biology, University of Seville

Correspondence e-mail: [javlopez@us.es]

Dianthus inoxianus is an endangered species endemic from a small littoral area in the SW Spain, with an unusual flowering season under the adverse conditions of dry Mediterranean summer. A greenhouse experiment was designed to assess the physiological traits involved in drought acclimation and recovery of 3-month-old plants. The evolution of plant water status, leaf gas exchange, chlorophyll fluorescence, photosynthetic pigments concentrations and a quantitative analysis of photosynthesis limitations were followed during water stress and re-watering. Our results indicated that plant water status values only decreased at the end of the drought period, together with the net photosynthetic rate. Photosynthetic impair was mainly caused by diffusional limitations of CO2, as indicated the joint and marked decrease of stomatal and mesophyll conductance and intercellular CO2 concentration during drought period, while the maximum carboxylation efficiency of Rubisco did not vary. After rewatering, leaf water status recovered faster than photosynthetic one, reaching control values on day 1 after recovery instead on day 7. Additionally, stomatal conductance showed the slowest recovery taking 15 days, but the decrease was enough to keep plant water status variables at constant values throughout the experiment. Results suggest a high tolerance and recovery of D. inoxianus from severe drought periods. This drought tolerance was also reflected in the stability of its photochemical apparatus (actual and maximum photochemical efficiency of PSII) and pigments concentrations, as indicated the constant values showed through the whole experiment. Conservation management of this endangered species is discussed in the context of future global climate change.

S.06-28-Oral

Plasticity in plant hydraulic traits: do we know what is going on?

Mencuccini, M.[1], Martinez-Vilalta, J.[2], Cochard, H.[3], Delzon, S.[4], Choat, B.[5]

(1) ICREA. (2) CREAF. (3) INRA PIAF. (4) University of Bordeaux. (5) University Western Sydney

Correspondence e-mail: [m.mencuccini@ed.ac.uk]

In addition to rapid evolution and to dispersal mechanisms, plasticity is often mentioned in the scientific literature as one of the few main processes available to plants in order to respond to climate change. Although the concept of plasticity goes back several decades, significant understanding of its ecological significance has occurred only in the past two decades. This is especially true for plant hydraulics. We contend a globally-wide perspective of the patterns regulating plasticity in plant hydraulic traits is currently missing. We identify the main constraints that limited available generalisations regarding plasticity and acclimation in plant hydraulics and argue that this knowledge gap needs to be urgently filled to help improve our basic understanding of plant functioning and help respond to pressing questions related to our ability to predict terrestrial ecosystem responses to global change-related challenges. Basic questions to be addressed relate to the following areas: the relationship between hydraulic traits showing substantial plasticity versus those showing substantial invariance; the measurement and significance of acclimation in plant hydraulic traits; the balance between physiological and structural acclimation; the significance of plasticity at scales varying from microscopic changes in wood and cellular properties to whole-plant changes in functional balance; the relationship between phenotypic plasticity and individual- and population-level genetic variability. Preliminary results from a global meta-analysis of plasticity in plant hydraulic traits will be presented, with an emphasis on trends specific to Mediterranean ecosystems. Further ways in which these analyses may be developed will also be discussed.