



HAL
open science

Variations of the stem diameter as an indicator of plant mortality under extreme drought in lavender

Lia Lamacque, Florian Sabin, Thierry Ameglio, Guillaume Charrier, Stéphane Herbette

► To cite this version:

Lia Lamacque, Florian Sabin, Thierry Ameglio, Guillaume Charrier, Stéphane Herbette. Variations of the stem diameter as an indicator of plant mortality under extreme drought in lavender. 4th Xylem International Meeting, Sep 2019, Padoue, Italy. Univ. Degli Studi Di Padova, 85 p., 2019, XIM4 - Fourth Xylem International Meeting. hal-02306197

HAL Id: hal-02306197

<https://hal.science/hal-02306197>

Submitted on 4 Oct 2019

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.

Variations of the stem diameter as an indicator of plant mortality under extreme drought in lavender

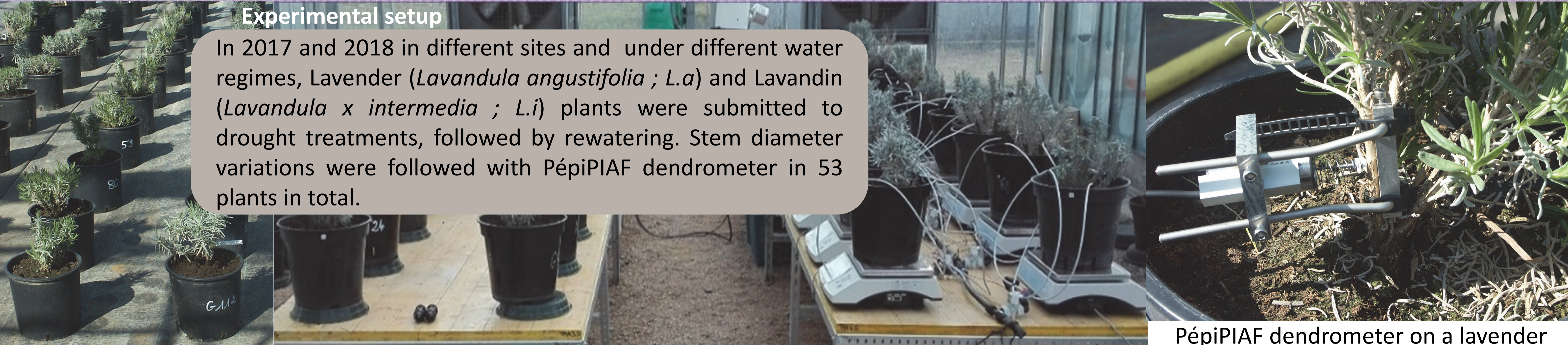
Context: French lavender crops suffer from a high rate of mortality due to drought events and we need to improve our capacity to monitor and predict plant mortality under drought.

- Aims:**
- Find a new accurate mortality index (or point of non-return) based on continuous measurement of stem diameter.
 - Investigate the mechanisms of drought-related mortality in lavender

Percentage Loss of Diameter as a « point of non-return »

Experimental setup

In 2017 and 2018 in different sites and under different water regimes, Lavender (*Lavandula angustifolia* ; *L.a*) and Lavandin (*Lavandula x intermedia* ; *L.i*) plants were submitted to drought treatments, followed by rewatering. Stem diameter variations were followed with PépiPIAF dendrometer in 53 plants in total.



PépiPIAF dendrometer on a lavender

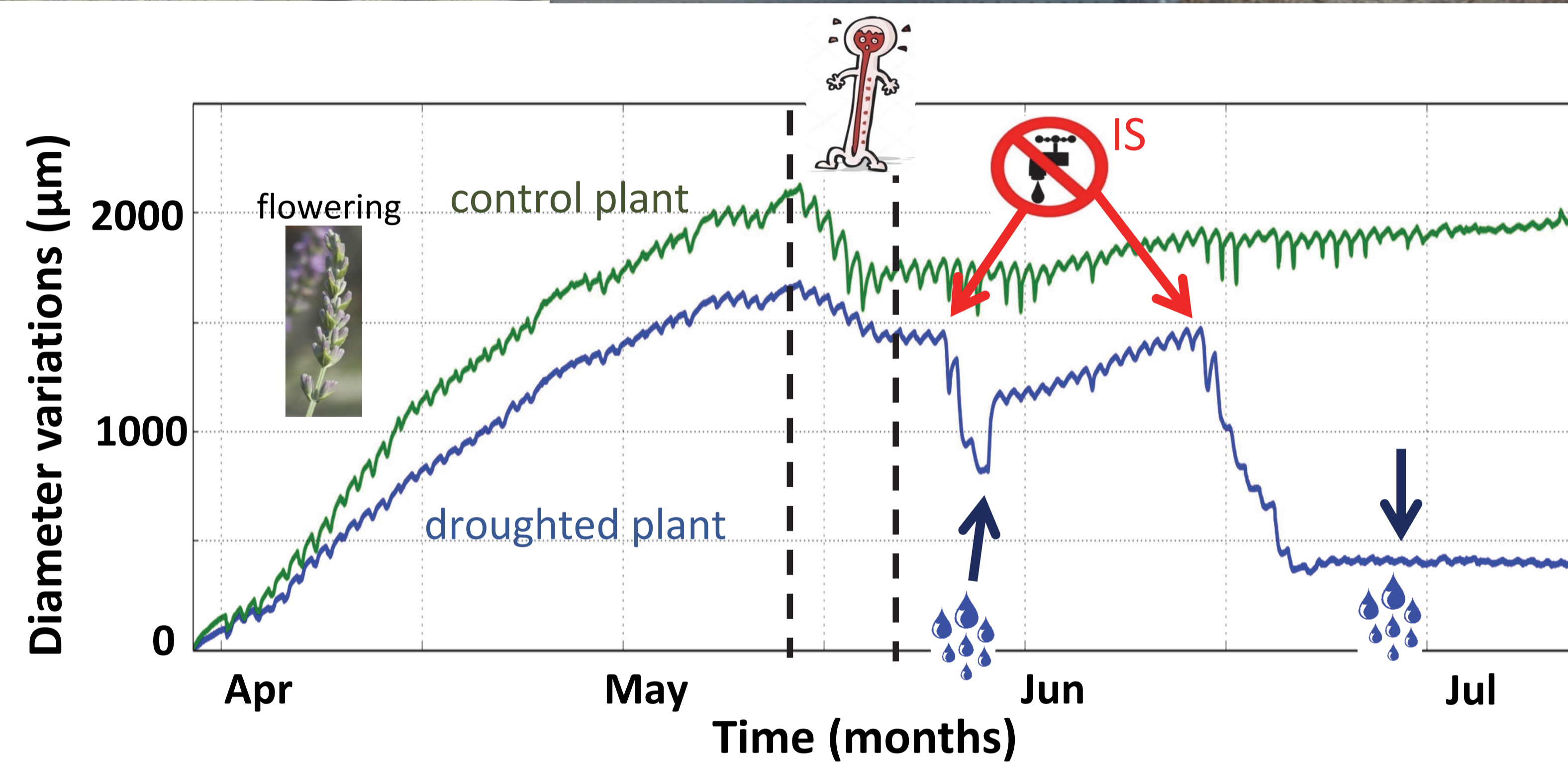


Fig 1. Example of continuous diameter variation during the growing season for a control (green) and a droughted plant (blue): two successive irrigation stops followed by rewatering.

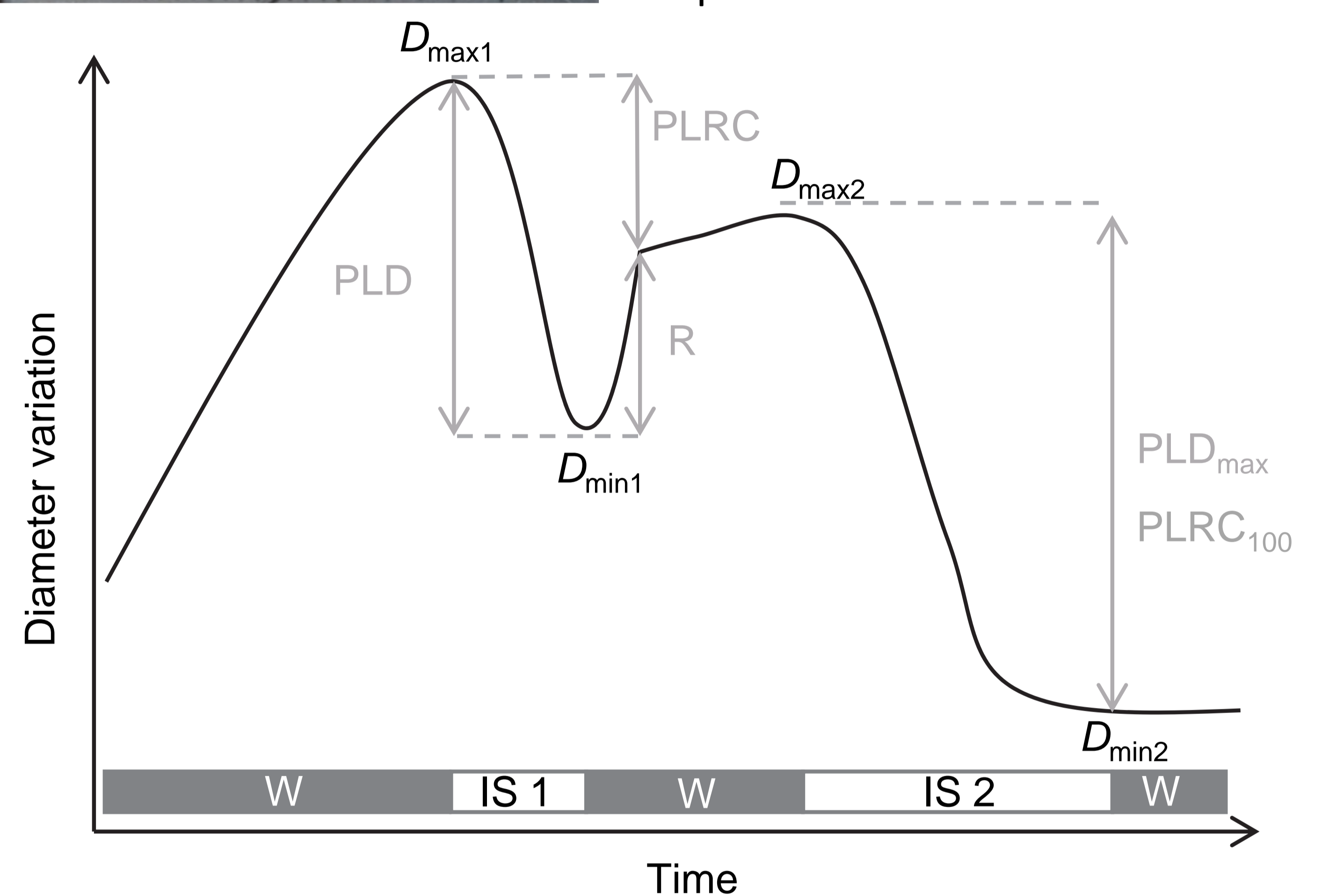


Fig 2. Typical branch diameter variation versus time during drought experiments. W indicates optimal watering conditions and IS irrigation stops. D_{max} and D_{min} represent the maximum and minimum diameter before IS and before rewatering, respectively. Computed indexes are: percentage loss of diameter (PLD), Recovered diameter (R) and percentage loss of rehydration capacity (PLRC). **PLD_{max} and PLRC₁₀₀ were reached when no recovery was observed after a rewatering.**

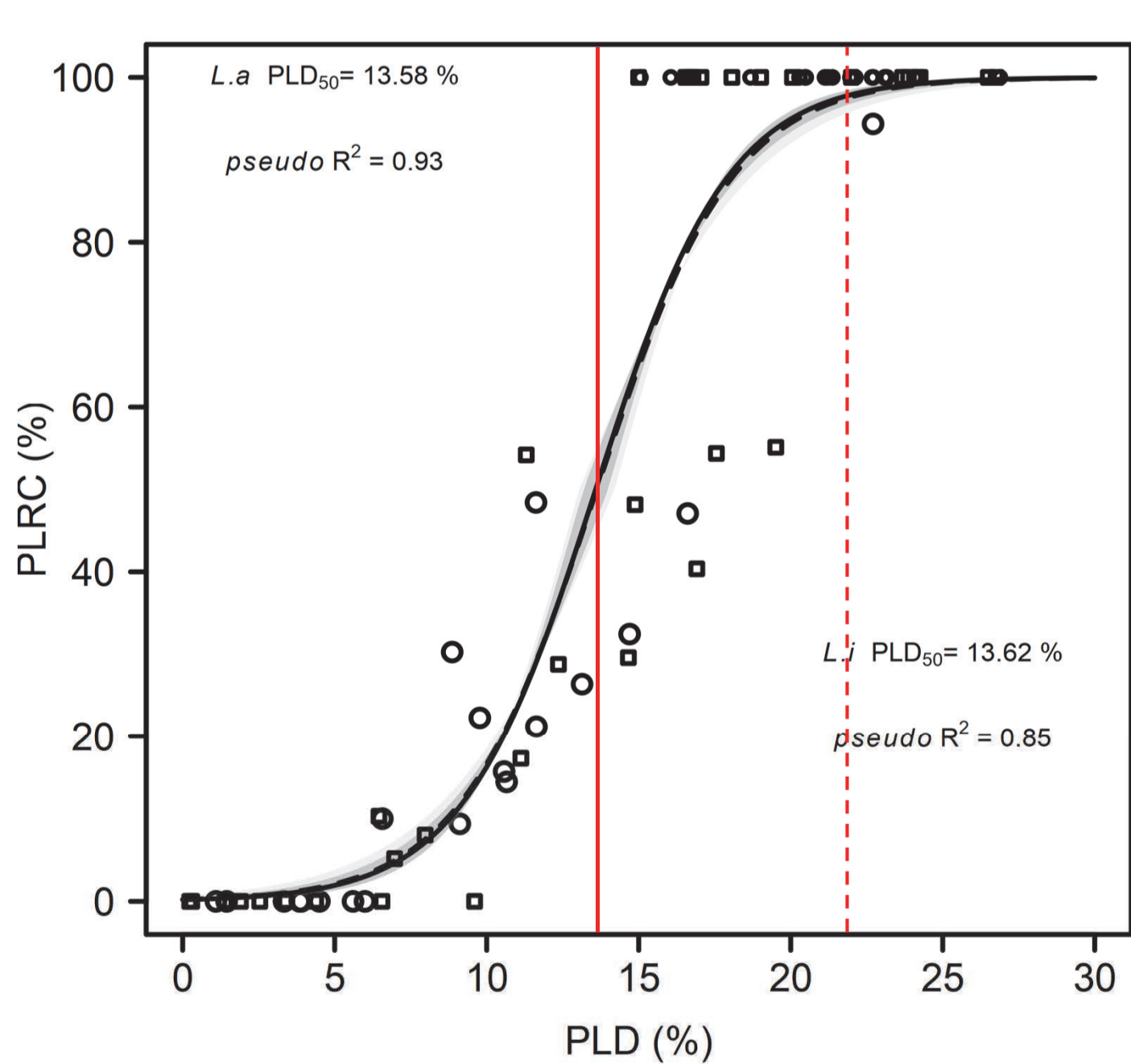


Fig 3. PLRC versus PLD or the branch diameter threshold for drought-induced mortality in Lavender (circles) and Lavandin (squares). The red vertical line is the PLD₅₀ and the red vertical dashed line is the mean PLD_{max}.

→ PLD_{max} was not significantly different between *L.a* and *L.i* and different water regimes and was associated with mortality. Mean PLD_{max} = 21.15 %

Mechanisms for drought-related mortality in lavender

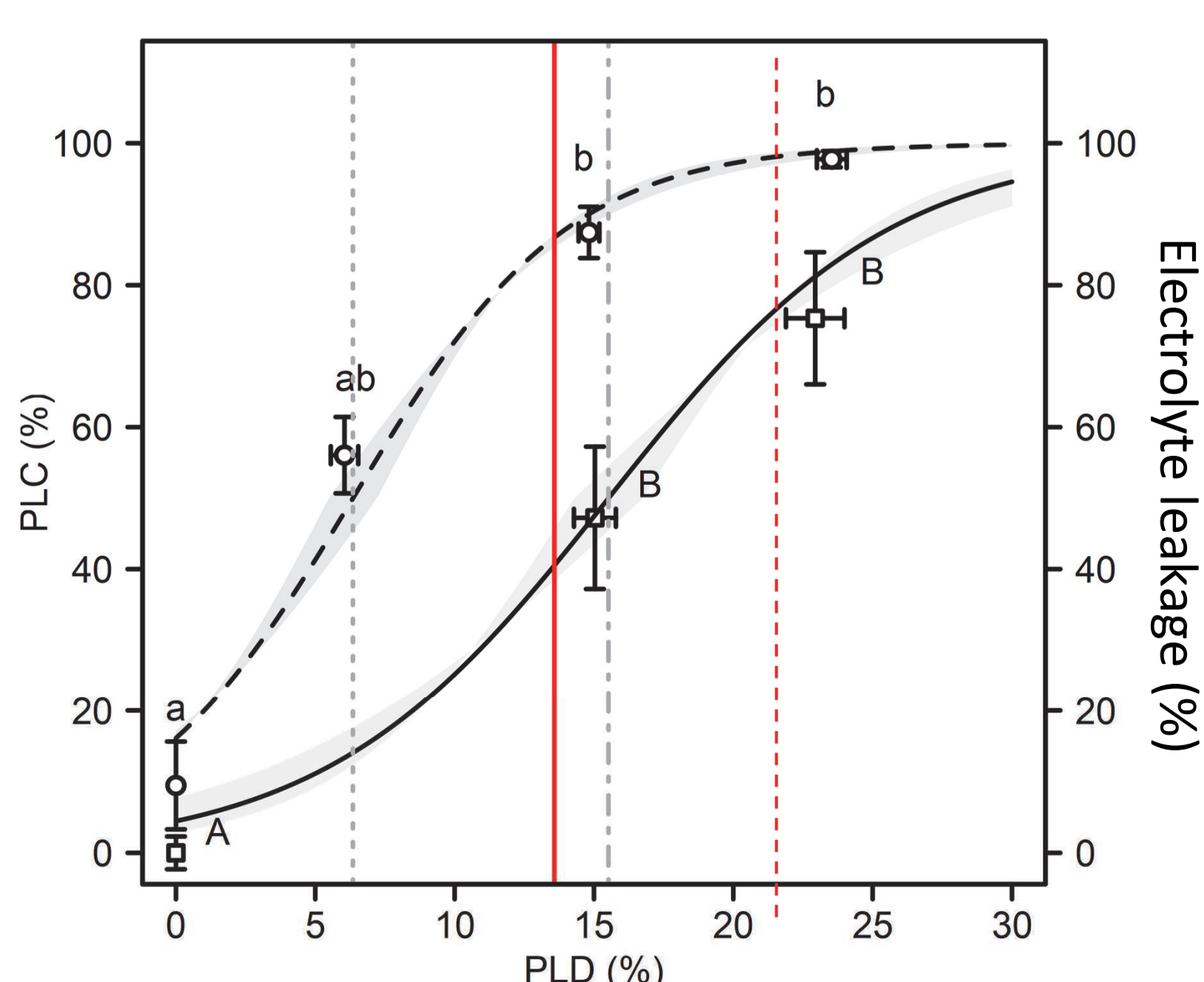


Fig 4. PLD-course of PLC (dotted line) and EL (black line) in a dehydrating *L.a*. The first grey dotted vertical line is the PLD_{50h} (PLC-driven), the red vertical line is the PLD₅₀ (Fig.3), the last grey vertical line is the PLD_{50c} (EL-driven) and the red dashed vertical line is the mean PLD_{max}. This experiment was performed in climatic chamber at constant temperature (25°C) over ca. 10 days.

→ PLD_{50c} and PLD₅₀ are similar, contrary to PLD_{50h} which is very different.

Key messages and perspectives

- PLD_{max} is a point of non return in lavender species
- Cavitation occurs mainly before cell lysis under drought
- PLD is a new indicator that could help to anticipate lavender death in the field
- Is PLD_{max} a relevant threshold in other species ?