**Frost and drought stress in subtropical eucalypts: a possible cross-tolerance?**

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As trees are long-lived organisms, they are more likely to suffer the adverse effects of climate change. In this scenario, an understanding of how forest trees adapt to harsh environmental conditions is essential in order to sustain productivity over time. Temperature and rainfall variability will probably be the main issues, triggering abiotic and biotic stress on plantations.

It is well know that tree responses and tolerance to abiotic stress are complex biological processes. Still, the active accumulation of solutes to avoid cellular dehydration is a common physiological response to drought, salinity and cold stress. Previous studies have demonstrated that this mechanism is highly relevant in defining the stress tolerance in plants.

*Eucalyptus benthamii* is a frost tolerant species suitable for plantation in subtropical and temperate areas. However, only scarce information is available on this and other subtropical eucalypts regarding their drought tolerance, and in what way drought stress affect their ability to endure frosts. An experiment was carried out with four genetic materials, *E. benthamii*, *E. dunnii*, *E. grandis* and an *E. grandis* x *E. camaldulensis* clone under three watering regimes, 100% water loss reposition (control), 50% water loss reposition and 25% water loss reposition, for 20 days. Fifteen plants per treatment were evaluated for growth and electrolyte leakage (EL) by freezing temperatures. Five of these plants were sampled for metabolic analyses (leaves, stem and roots) and five were destroyed to asses dry matter content and specific leaf area. The remaining five plants were unwatered for 10 days and then rewatered for 45 days, for regrowth evaluation.

The partial replenishment of the water lost by transpiration induced a reduction in growth, dry mater production, relative water content, leaf area and specific leaf area in the four genetic materials. On the other hand, water use efficiency was higher and EL was lower under drought stress treatments. Moreover, *E. benthamii* showed lower EL, resumed growth quickly and was less affected by 10 day unwatering than other treatments, being *E. grandis* the most affected by the artificial freezing assay and unwatering.

These responses and previous work show that *E. benthamii* can handle drought and cold stress under the tested conditions. Further work needs to focus on the underlying mechanisms and their genes to be used in genomic selection and genetic engineering.