

## Abstract

# Effect of Water Stress on Physiology and Carbon Balance in Seedlings of Different Eucalyptus Genotypes <sup>†</sup>

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**Abstract:** Eucalyptus is a fast-growing genus widely used in the forestry industry; however, in its early stages, plantations are susceptible to drought conditions, and it is common to find high mortality rates and loss of productivity. Therefore, the study analyzed the physiological response photosynthesis ( $A_n$ ) and predawn leaf water potential ( $\Psi_{PLWP}$ ) and the change in carbon balance (C) in ten Eucalyptus genotypes exposed to different water deficits, with the hypothesis that it is possible to identify and differentiate genotypes with tolerance to drought. Therefore, ten one-year-old genotypes were used in greenhouse conditions and soil matric power ( $\Psi_s$ ) was regulated in four levels:  $-0.03$  MPa (control),  $-0.7$  MPa (slight stress),  $-1.5$  MPa (moderate stress) and  $-2.5$  MPa (chronic stress); each level was determined from automated monitoring of soil conditions. The example considered of the experiment was tree tress per genotype  $\times \Psi_s$ . The measurements of  $A_n$  and  $\Psi_{PLWP}$  considered tree measurement per individual ( $n = 9$  per genotype  $\times \Psi_s$ ), in contrast, the Gross primary productivity (GPP) was estimated with destructive sampling ( $n = 3$  genotype  $\times \Psi_s$ ). We found a significant relationship between water deficit and physiological response (major deficit produced a reduction of  $A_n$  and  $\Psi_{PLWP}$ ). *E. nitens* clones had a minor physiological variation and GPP maintained the same trend and proportionality between aerial and underground production. In contrast, two hybrids of *E. nitens*  $\times$  *E. globulus* showed an immediate physiological change and variation of GPP, with increased underground production and stagnant aerial production. These results suggest that it is possible to differentiate genotypes with tolerance to water deficit early. This will allow genotype selection according to the climatic conditions of each site, minimizing mortality and optimizing the available water resource.

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