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GROWTH CHARACTERISTICS OF TWO SELECTED *EUCALYPTUS* CLONES IN RELATION TO PHYSIOLOGICAL RESPONSES

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ABSTRACT

The water relations, leaf gas exchange characteristics, xylem cavitation, and root-shoot hydraulic conductances of two *Eucalyptus* clones grown at a mesic site were assessed when they were three months old to reveal whether there are any clonal differences in growth rates which are related to the plant physiological characteristics. Soil water potential (Ψ_{soil}), assessed as predawn leaf water potential (Ψ_{PDL}), showed that the compartment supporting clone TAG14 had higher Ψ_{soil} (-0.12 MPa) than the compartment supporting clone GU210 (-0.20 MPa). Diurnal values of leaf water potential (Ψ_L), net photosynthesis (A), transpiration rate (E) and stomatal conductance (g_s) were consistently higher in TAG14 than in GU210. Midday Ψ_L in TAG14 was -1.59 MPa while in GU 210 it was -1.85 MPa. However, this difference was not statistically significant. Ultrasonic acoustic emission (UAE) indicated by maximum events per hour (EPH_{max}) and threshold water potential corresponding to the initiation of rapid cavitation (ψ_{CAV}, cUAE%) showed that TAG14 is more prone to xylem cavitation than GU210 and this could lead to a reduction in g_s in GU210 from midmorning onwards. Use of a high pressure flow meter (HPFM) showed that the root conductance per unit leaf area ($K_{r/LA}$) was higher in TAG14 than in GU210, whereas, shoot conductance per unit leaf area and shoot dry weight ($K_{S/LA}$, $K_{S/tsdw}$) were higher in GU210 than in TAG14. Whole plant conductances, expressed per unit leaf area ($K_{P/LA}$) were higher in TAG14 than in GU210. However, all the physiological measurements were consistent with the hypothesis that higher hydraulic conductances as observed in TAG14 leading to lower leaf level water stress and higher photosynthetic rates. Above ground biomass of TAG14 was also higher than that of GU210, which is in agreement with this hypothesis.

Keywords: Eucalyptus spp clones, leaf physiology, stem xylem cavitation, root-shoot hydraulic conductances, growth.