17-21 September 2018,

Le Corum, Montpellier - France

Eucalyptus 2018

Managing *Eucalyptus* plantations under global changes

Abstracts Book

Potassium fertilization affects hydraulic responses to height growth in Eucalyptus trees

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Climate change and in particular the increase in frequency and duration of drought is affecting the functioning and growth of *Eucalyptus* plantations. Drought-induced dieback of Eucalypt plantations has already been reported over large areas in Brazil and are expected to increase in the future. These effects are expected to be particularly acute on tall trees, which commonly show decreased xylem hydraulic conductance and thus a reduced ability to transport water from soil to leaves. Potassium (K) fertilization may be a crucial managing tool to mitigate the negative effect of drought on Eucalypt plantations, as it has been reported to strongly affect tree structural and physiological adjustments to water deficit. Here, we present results from a split-plot experimental design set up in June 2010 within a highly productive *E. grandis* Hill ex Maid clone that includes 4 treatments: two K supply regimes (commercial K fertilization versus no K addition) crossed with two rainfall regimes (1/3 rainfall exclusion versus unaffected rainfall) applied in three blocks. The responses of sapflow-derived canopy conductance, leaf area (Al), sapwood area (As), leaf-specific hydraulic conductance and soil–leaf water potential gradient to height growth were investigated over a 6-year period (from planting to harvesting). Al and As were both significantly reduced in the absence of K, but in contrasting proportions, which resulted in a strong increase in As:Al ratio in K-depleted treatments. A sensibility analysis conducted using a model based on Darcy's Law showed that these allometric adjustments in K-depleted plots partly compensated the expected decrease of leaf-specific hydraulic conductance and canopy transpiration with height growth. The implications of our findings for the management of Eucalypt plantations in the face of climate changes, and the role of K fertilization in future management guidelines will be discussed.

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Keywords: Fertilization, tree hydraulic, leaf area, sapwood area, transpiration, water exclusion experiment