



Environmental and plant-based controls of water use in a Mediterranean oak stand

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ABSTRACT

In this work, new information is reported on water relations of the Mediterranean oak species *Quercus pyrenaica* based on environmental and physiological measurements carried out during the growing seasons of 2006 and 2007. The interest in this species has increased due to its use in reforestation programs and its impacts on the water resources due to the extensive spontaneous afforestation after the abandonment of forest (firewood, charcoal, livestock, etc.) and agricultural activities, in general in some areas in the Mediterranean region and in particular, in the studied area (*Sistema Central* range, Spain). The objectives were to evaluate the long-term water use of this stand and its limit and to analyse the specific traits to cope with summer drought, especially the use of stem water storage and deep soil water reserves. Tree water stress associated with depletion of soil water reserves was not observed since the oak trees appeared to avoid a marked water stress using water reserves from deeper soil layers as summer drought progresses. The contribution of mean daily stem water storage to transpiration was low (4%), although it could be greater under dryer conditions. Only at the end of summer of 2006, the transpiration and canopy conductance were reduced due to soil drought. Despite the absence of marked water stress an upper limit was found in transpiration (slightly higher than 3 mm day^{-1}). The heavy use of soil water resources by this species (75% of available soil water in this study) should be considered when evaluating the impact of spontaneous afforestation and reforestation programs on water resources.

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