Tropentag, October 5-7, 2011, Bonn

"Development on the margin"

Acclimatation of Co-occurring Tree Species to Water Stress and their Role as Site-indicators in Mixed Pine-oak Forests in Northeast Mexico

Wibke Himmelsbach, Eduardo Javier Treviño Garza, Humberto González Rodríguez, Marco Aurelio Gonzalez Tagle

University of Nuevo León, Dept. of Silviculture and Forest Management, Mexico

Abstract

Mixed pine-oak forests are widely distributed in the higher altitudes of the eastern Sierra Madre, Mexico, including ecologically and economically important tree species. These forests are exposed to extreme climatic conditions of high temperatures and low precipitation distributed irregularly through the year. Under field conditions, water stress or rather soil water availability is one of the major limiting factors in plant growth and affects most physiological processes in these ecosystems. Moreover climatic change and human activities accelerate forest degradation and deforestation. In order to characterise the acclimatation of native species to these stresses, leaf water (Ψw) and osmotic potentials (Ψs) of *Juniperus flaccida*, *Pinus pseudostrobus* and *Quercus canbyi* were measured under natural drought and non-drought conditions under two different aspects in the Sierra Madre Oriental. Factorial ANOVA revealed significant differences in Ψw and Ψs between two aspects, species and sampling dates. In general, all species showed high predawn and low midday values that declined progressively with increasing drought and soil-water loss. Seasonal and diurnal fluctuation of Ψw and Ψs were higher for *J. flaccida* and *Q. canbyi* than for *P. pseudostrobus*. Leaf Ψw and Ψs were mainly correlated with soil water content, while Ψs of *P. pseudostrobus* were hardly correlated with environmental variables. Thus, species showed different strategies to withstand drought. *P. pseudostrobus* was identified as a species with isohydric water status regulation, while *J. flaccida* and *Q. canbyi* presented water potential patterns typical for anisohydric species. Thus, isohydric behaviour is of advantage during severe but short periods of drought, while anisohydric water status regulation is favourable during long-term drought conditions of minor intensity. Detailed knowledge about the type of water status regulation may be a critical factor for plant survival and mortality in the context of climate change. Nevertheless, for precise conclusions about the advantages and disadvantages of each type, further long term investigations are required.

Keywords: *Juniperus flaccida*, osmotic potential, *Pinus pseudostrobus*, *Quercus canbyi*, restoration, water potential

Contact Address: Wibke Himmelsbach, University of Nuevo León, Dept. of Silviculture and Forest Management, Pitayo 1106 Fovissste, 67755 Linares, Mexico, e-mail: wibke.sierramadre@gmail.com