Tropentag, October 7-9, 2008, Hohenheim

"Competition for Resources in a Changing World:
New Drive for Rural Development"

Drought Resistence of Mixed Pine-Oak Forest Species in the Sierra Madre Oriental, Mexico

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

University of Nuevo Leon, Department of Silviculture, Mexico

Abstract

Mixed pine-oak forests are exposed to extreme environmental conditions where water availability is a limiting factor and climatic change makes the conditions for plant grow even more acute. In addition, unsustainable management contributes to the acceleration of forest degradation and deforestation in great parts of the mountain due to anthropogenic stresses like forest fires, agricultural, silvo-pastural and silvicultural activities, why natural regeneration and reforestation are difficult. The response of ecosystems to such climatic and anthropogenic stresses will depend in part on the drought tolerance capabilities of the individual species. In order to develop and apply sustainable management or reforestation programs, detailed knowledge about the physical condition of tree species and their capacity to respond to a dynamic environment is an important precondition. The objectives of our study were to assess and quantify how seasonal plant water potentials (Ψw) and osmotic potentials (Ψs) are related to soil water availability and evaporative demand components in four tree species (*Acacia rigidula*, *Juniperus flaccida*, *Pinus pseudostrobus*, and *Quercus canbyi*) under natural drought and non-drought conditions in the Sierra Madre Oriental. All species showed high predawn and low midday values that declined progressively with increasing drought and soil-water loss. During the dry period, juniper and oak had the lowest Ψw and Ψs while A. rigidula maintained relatively high values. However, *J. flaccida* and *Q. canbyi* recovered high water potentials during the wet months indicating their capacity to overcome drought. *A. rigidula* had a wide range between predawn and midday Ψw during the dry season suggesting drought resistance. Ψw was positively correlated with soil water content for *Q. canbyi* and *J. flaccida*, and between 30 % and 47 % of temporal variation in predawn water potential (Ψwpd) was explained by soil water content. Ψs was correlated with climatic variables for *J. flaccida* and *Q. canbyi*. Finally, *A. rigidula*, *Q. canbyi*, and *J. flaccida* had better capacity to withstand drought than pine, and are considered as suitable candidates for reforestation programs on dry sites in the Sierra Madre Oriental in Mexico.

Keywords: *Acacia rigidula*, drought stress or resistance, *Juniperus flaccida*, Mexico, *Pinus pseudostrobus*, *Quercus canbyi*, restoration, Sierra Madre Oriental, water- and osmotic potential

Contact Address: Wibke Himmelsbach, University of Nuevo Leon, Department of Silviculture, Olivo 330, Edificio 8, 67755 Linares, Mexico, e-mail: waldkauz-ruft@web.de