Water Relations in Native Trees, Northeastern Mexico

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Introduction.

The main type of vegetation in northeastern Mexico, known as the Tamaulipan thornscrub, is distinguished by a wide range of taxonomic groups exhibiting differences in growth patterns, leaf life spans, textures, growth dynamics, and phenological development (Reid *et al*., 1990). Vegetation has been utilized as a forage source for domestic livestock and wildlife, fuelwood, timber for construction, medicine, agroforestry and reforestation practices in disturbed sites. Since water availability is the most limiting factor controlling tree growth, survival and distribution in dry climates, the great diversity of native tree species in this region reflects the plasticity of how tree species cope with seasonal water stress. Therefore, shrub and tree species have evolved key morphological and physiological traits suited for adaptation to environmental constraints, especially on drought-prone sites. The strategies include early leaf abscission, limited leaf area, an extensive and deeper root system, reduction of water loss by stomatal closure and accumulation of solutes.

Objetive.

To assess and quantify how seasonal plant water potentials are related to soil water availability and evaporative demand components in four native tree species.

Materials and Methods.

Research site

Plant material

Four native tree species were randomly selected from a 20 m x 20 m representative and undisturbed thornscrub plot. The tree species were: *Cordia boissieri* (Boraginaceae), *Condalia hookeri* (Rhamnaceae), *Diospyros texana* (Ebenaceae) and *Bumelia celastrina* (Sapotaceae).

Water potential measurements and sampling procedures

Determinations of leaf water potential (Ψ, MPa) in the four native tree species were conducted, when possible, at 10-days intervals. At each sampling date, Ψ of five different plants were randomly chosen from the experimental plot. The period of measurement was between July 10 and November 30, 2007. On each sampling date, Ψ measurements were taken from terminal twigs of chosen plants and monitored at 06:00 h (Ψpd, predawn) and 14:00 h (Ψmd, midday) local time. Ψ was estimated using a Scholander pressure bomb (SoilMoisture Equipment).

Statistical analyses

Ψ data were subjected to one-way ANOVA. Differences were validated using the Tukey's test and were considered statistically significant at $P<.05$. Spearman's correlation analyses were performed between water potential data and environmental variables.

Table 1. **Calculated mean square error (MSE), *F*- and *P*-values, and coefficient of determination (R^2) from one-way ANOVA results for Ψpd and Ψmd leaf water potential at each sampling date.**

Sampling	Ψpd (MPa)				Ψmd (MPa)			
Date (2007)	MSE	*F-value*	*P-value*	R^2	MSE	*F-value*	*P-value*	R^2
Jul-10	0.034	4.91	.0131	.4797	0.162	7.42	.0025	.5818
Jul-20	0.055	4.67	.0158	.4669	0.070	5.67	.0076	.5157
Jul-30	0.019	11.09	.0003	.6754	0.069	3.41	.0429	.3905
Aug-10	0.125	13.15	.0001	.7115	ND			
Aug-20	ND				ND			
Aug-30	0.053	5.05	.0119	.4865	0.067	6.68	.0039	.5564
Sep-10	0.027	4.66	.0158	.4667	0.047	3.44	.0420	.3923
Sep-20	0.018	17.21	<.0001	.7634	0.081	2.25	.1211	.2973
Sep-30	0.020	2.55	.0920	.3237	0.052	4.89	.0134	.4784
Oct-10	0.057	6.90	.0034	.5641	ND			
Oct-30	ND				ND			
Nov-10	ND				ND			
Nov-30	ND				ND			

Results.

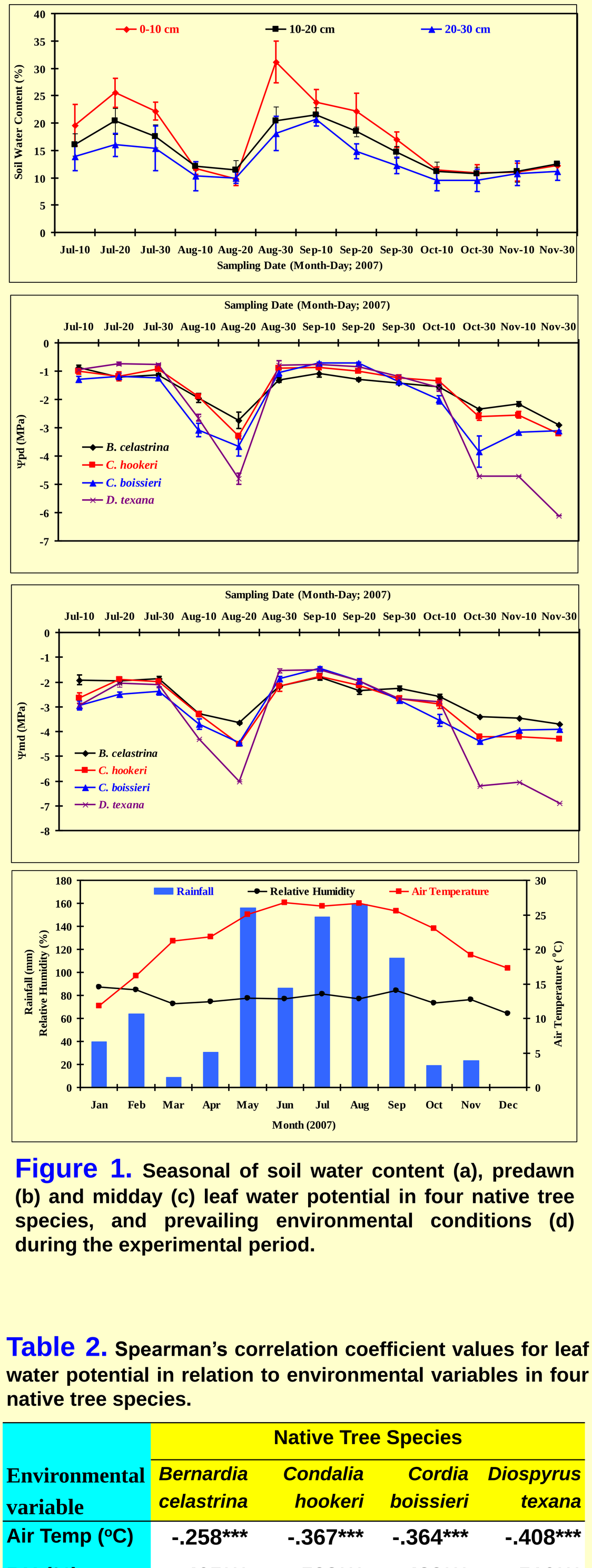

Figure 1. **Seasonal of soil water content (a), predawn (b) and midday (c) leaf water potential in four native tree species, and prevailing environmental conditions (d) during the experimental period.**

Table 2. **Spearman's correlation coefficient values for leaf water potential in relation to environmental variables in four native tree species.**

Environmental variable	Native Tree Species			
	Bernardia celastrina	*Condalia hookeri*	*Cordia boissieri*	*Diospyrus texana*
Air Temp (°C)	-.258***	-.367***	-.364***	-.408***
RH (%)	.405***	.528***	.482***	.516***
VPD (kPa)	-.373***	-.490***	-.459***	-.495***