Morphological and Physiological Leaf Traits in Ten Native Shrubs, Northeastern Mexico

H. Gonzalez Rodriguez, I. Cantu Silva, R.G. Ramirez Lozano, M.V. Gómez Meza, and J.M. López Hernández

Universidad Autónoma de Nuevo Leon, Faculty of Forest Sciences

Carr. Nac. No 85, km 145, Linares, Nuevo Leon 67700 Mexico. **E-mail: humberto.gonzalezrd@uanl.edu.mx**

Introduction.

The structure of leaves has important implications for the growth and development of plant in specific habitats (Garnier et al., 1999). Besides, Sclerophylly has been a successful adaptation morphological and anatomical mechanism for plants growing in dry ecosystems since they own to conserve water, nutrients and provides protection against herbivory (Turner, 1994). In this regard, when discussing sclerophylly is that xeric/sclerophyllous leaves are strongly correlated with tolerance to dehydration or exhibit leaf/xylem water potentials below -4.0 MPa without apparent damage. Thus leaf traits play an important role in leaf and plant functioning and is related to species' strategies of resource acquisition and use. Furthermore, vegetation in northeastern Mexico, 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). Since water availability is the most limiting factor controlling tree growth, survival and distribution in dry climates, the great diversity of native shrub 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 leaf traits suited for adaptation to environmental constraints, especially on drought-prone sites.

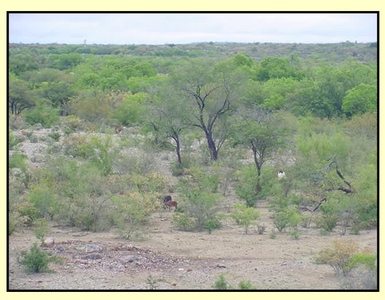
Objetive.

To assess and quantify how leaf traits vary among species, contrast the relationships among leaf morphological traits and to describe the level of adaptation to water stress through water potential determinations.

Materials and Methods.

Research site

Linares
(24°47´N, 99°32´W)
Altitude: 350 masl
Annual Rainfall: 800 mm
Maen Air Temperature:
14.7°C (January) to
22.3°C (August)



Plant material

Table 1 illustrates the ten native shrub species that were randomly selected from a representative and undisturbed thornscrub plot (20 m x 20 m). These species are representative of the native vegetation in the northeastern region of Mexico.

Leaf morphological traits

Leaf samples (50 observations per species) were used to determine leaf fresh weight, leaf length, petiole length, total leaf length, leaf width, leaf area, leaf dry weight, leaf shape, and specific leaf area (leaf area to leaf dry weight) were determined in accordance to Reich et al., (1992) and Cornelissen et al., (2003). Leaf morphology of studied shrubs is shown in Figure 1.

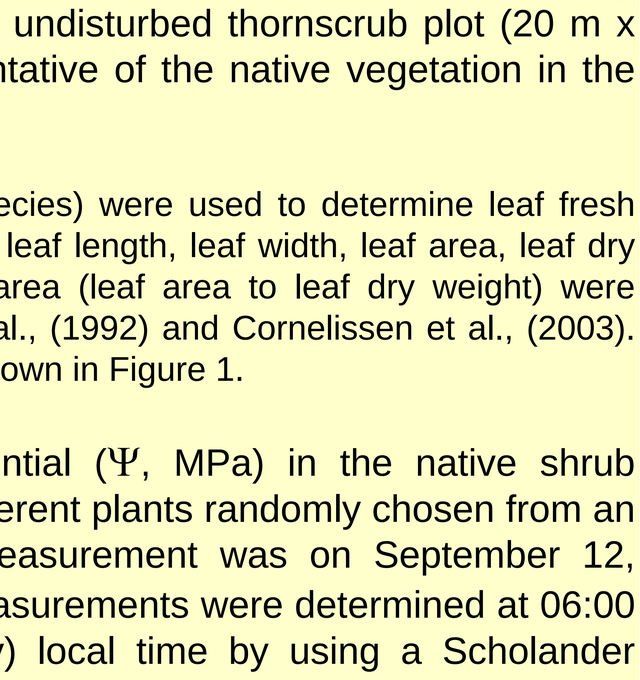
Water potential measurements

Determinations of leaf water potential (Ψ, MPa) in the native shrub species were conducted on four different plants randomly chosen from an experimental plot. The date of measurement was on September 12, 2012. On this sampling date, Ψ measurements were determined at 06:00 h (predawn) and 14:00 h (midday) local time by using a Scholander pressure bomb.

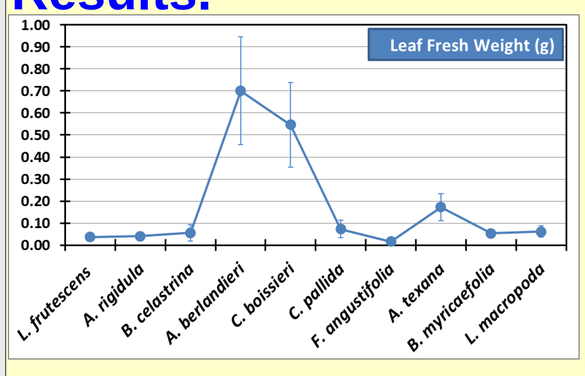
Table 1. Species, family and leaf phenology of studied shrub species.

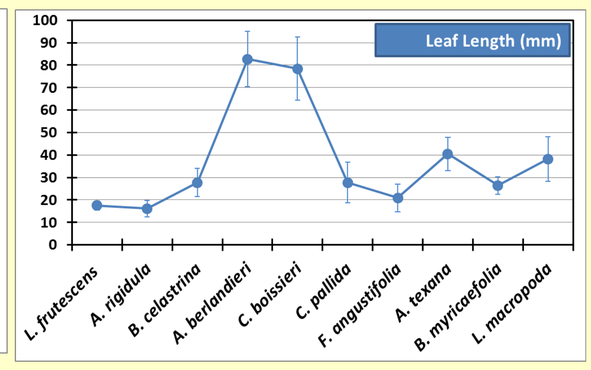
No.	Species	Family	Leaf Phenology
1	*Amyris texana*	Rutaceae	Evergreen
2	*Acacia rigidula*	Fabaceae	Evergreen
3	*Forestiera angustifolia*	Oleaceae	Deciduous
4	*Celtis pallida*	Ulmaceae	Semi-deciduous
5	*Bumelia celastrina*	Sapotaceae	Deciduous
6	*Acacia berlandieri*	Fabaceae	Deciduous
7	*Cordia boissieri*	Boraginaceae	Evergreen
8	*Leucophyllum frutescens*	Scrophulariaceae	Evergreen
9	*Lantana macropoda*	Verbenaceae	Deciduous
10	*Bernardia myricifolia*	Euphorbiaceae	Deciduous

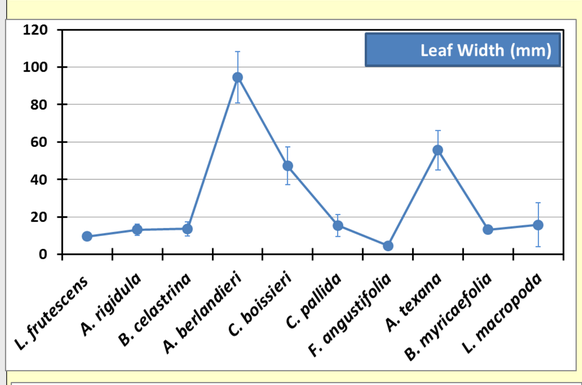
Figure 1. Morphological leaf types of 10 native shrub species, norhteastern Mexico. The scale is represented in cm.

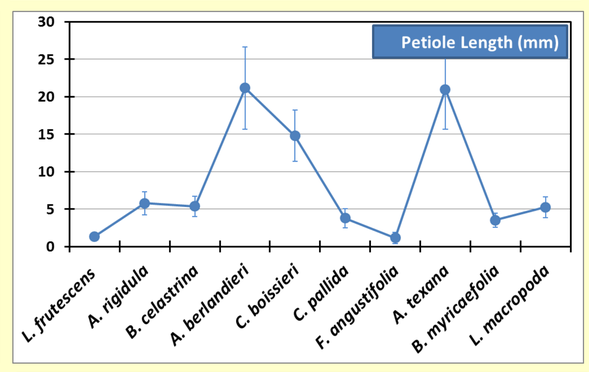


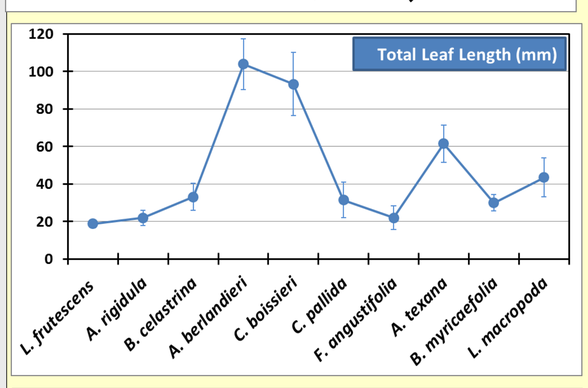
Results.

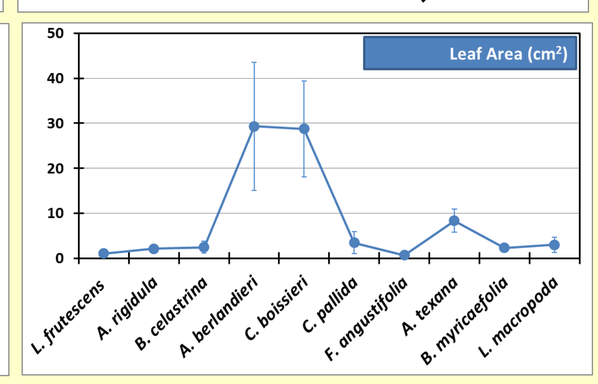


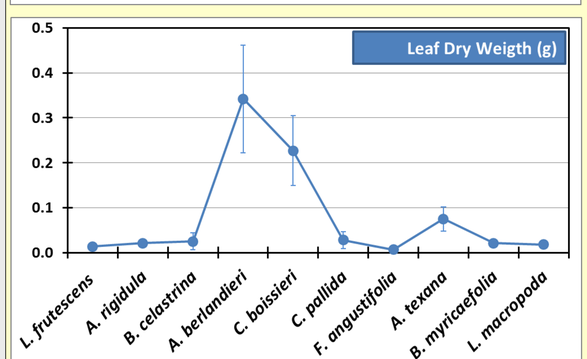


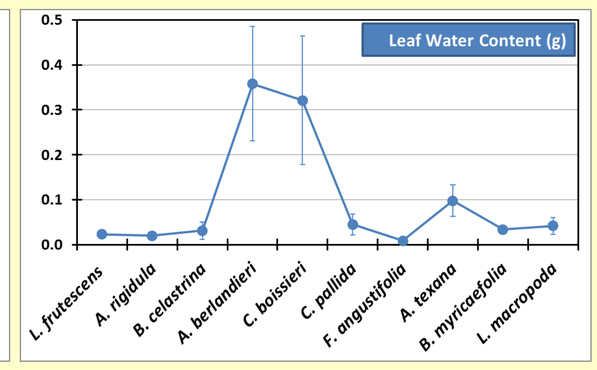


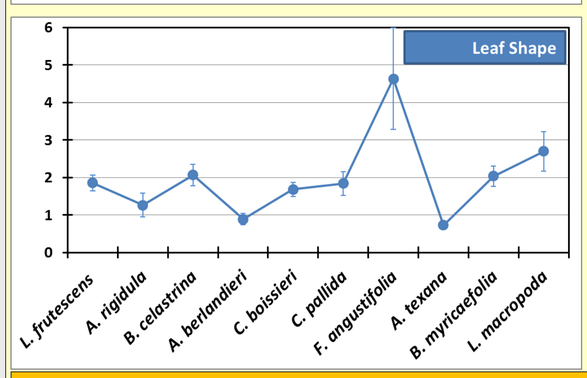












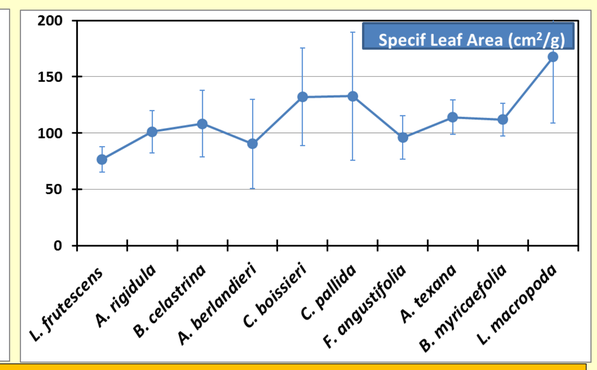


Figure 2. Leaf traits characteristics in ten native shrub species, northeastern Mexico. Plotted values represent the mean (n=50) and standard deviation.

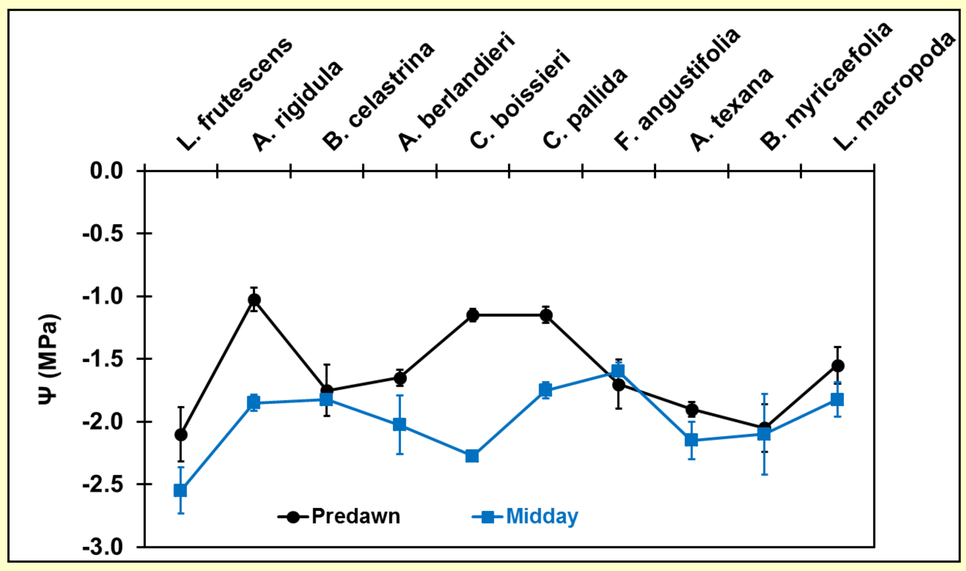


Figure 3. Predawn and midday leaf water potential in ten native shrub species. Plotted values represent the mean (n=4) ± SD.

Table 2. Pearson correlation coefficient (above) and significance (below diagonal line) values (n=500) among leaf traits.

Variable	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
V1. Leaf Fresh Weight		.915	.865	.712	.912	.918	.982	.987	-.375	-.048	.189
V2. Leaf Length	.001		.839	.729	.984	.904	.885	.914	-.294	.166	.074
V3. Leaf Width	.001	.001		.878	.895	.802	.876	.831	-.550	-.015	.227
V4. Petiole Length	.001	.001	.001		.838	.691	.705	.698	-.554	.034	.216
V5. Total Leaf Length	.001	.001	.001	.001		.899	.887	.908	-.377	.141	.115
V6. Leaf Area	.001	.001	.001	.001	.001		.885	.919	-.351	.137	.151
V7. Leaf Dry Weight	.001	.001	.001	.001	.001	.001		.940	-.382	-.130	.297
V8. Leaf Water Content	.001	.001	.001	.001	.001	.001	.001		-.359	.024	.091
V9. Leaf Shape	.001	.001	.001	.001	.001	.001	.001	.001		-.010	-.116
V10. Specific Leaf Area	.289	.001	.733	.447	.002	.002	.004	.596	.825		-.605
V11. Leaf Dry Matter	.001	.097	.001	.001	.010	.001	.001	.042	.010	.001	