

DETERMINING PLANT WATER USE AND CROP COEFFICIENTS OF SELECTED NURSERY AND LANDSCAPE PLANTS

Project team: Genhua Niu (Principal Investigator)¹, Raul I. Cabrera², Cynthia McKenney² and Wayne A. Mackay²

¹ Texas Agricultural Experiment Station, El Paso, Texas A&M University System
1380 A&M Circle, El Paso, TX 79927

Phone: 915-859-9111 Fax: 915-859-1078 E-mail: gniu@ag.tamu.edu

² Texas Agricultural Experiment Station, Dallas, Texas A&M University System

Objectives

Water conservation is a critical issue throughout Texas and the Southwest of the United States due to diminishing water supply, increasing population, and continuous drought. In the nursery industry, the cost and availability of high-quality irrigation water are important considerations. The irrigation water price has increased rapidly in recent years (Casa Verde Nursery, personal communication). While the majority of plants are produced in various-sized containers, it is largely unknown how much water a container-grown plant requires for maximum growth and aesthetic value.

Plant water use is a function of evaporation and transpiration (evapotranspiration, ET) and, therefore, fluctuates with climatic conditions such as irradiance, temperature, humidity and wind. ET of a specific plant will also be influenced by plant morphology and physiology of the individual plant, as well as the characteristics of the plant canopy. Potential evapotranspiration (PET) modified by appropriate crop coefficient is commonly used to increase irrigation efficiency for agronomic crops and turfgrass. However, very limited information exists for nursery container plant production and landscape ornamental plants.

Our specific objectives are (1) to determine the water use and crop coefficients of selected landscape plants, which are commonly used in Texas urban landscapes; (2) to compare the difference, due to climate conditions and plant species, in water use and crop coefficients of the selected species grown in El Paso and Dallas so that broader recommendations on irrigation management can be made; and (3) to characterize plant water use in response to container soil moisture and climatic conditions.

Methodology

The following potential ornamental woody shrubs will be selected for this study. This selection is based on their planting popularity in Texas landscapes and their economic importance. The ornamental woody shrubs are: *Rosa* spp., *Lagerstroemia* spp., *Berberis thunbergii* 'atropurpurea', *Cotoneaster glaucophylla*, *Nerium oleander*, *Pittosporum tobira*, and *Photinia serrulata*.

Liners of the above plant species will be obtained in early spring from local nurseries and will be potted in 3 or 5-gallon containers filled with a common nursery growing medium. The containers will be placed in a fenced, outdoor field plot in completely randomized blocks with 6 replications. Plants will be fertilized with a controlled-release fertilizer.

Water use of plants will be determined gravimetrically: all plants will be irrigated thoroughly, allowed to drain completely, and weighed. After 24 hours, the plants will be weighed again. The

difference between the beginning and ending weights is the amount of water being used over the 24-hour period, in cubic centimeters or milliliter (ml).

$$ET_{\text{crop}} (\text{cm}) = \text{Volume of water use (cm}^3\text{)}/\text{container surface area (cm}^2\text{)}$$

Crop coefficient will be calculated as the following:

$$K_c = ET_{\text{crop}}/\text{PET}$$

Potential ET (PET) will be obtained from local weather stations. Since selected plant species may have different water use and tolerance to drought, the irrigation intervals will be adjusted properly so that every species will be re-irrigated before water stress sign exhibits. Therefore, the minimum water use of these plants will be the daily water use just before the stress sign exhibits. The soil moisture contents before re-watering will be recorded. Water holding capacity, porosity, and plant available water of the growing medium will be determined before the experiment starts.

Anticipated Results

The proposed project will provide information on actual water use of selected ornamental plants grown at two locations with different climatic conditions. Knowledge of actual water use of container-grown ornamental plants will help the nursery industry to enhance irrigation efficiency by scheduling irrigation timing and amount more accurately. Thus, irrigation water cost will be reduced, and runoff and groundwater pollution will be minimized. Since research will be conducted at two locations, broader recommendations on irrigation management may be given and extrapolation of the results may be possible for regions other than El Paso and Dallas.

Results will be disseminated to the nursery industry through TWRI and TWDB technical reports or newsletters, educational websites in College Station, El Paso, and Dallas. Appropriate fact sheets/guidelines will be prepared on water use and their irrigation recommendations. Oral or poster presentations will be delivered at professional and regional meetings.

Budget

We are requesting a research support fund of \$9,425 to cover expenses of plant materials, containers, potting medium, fertilizer, and irrigation equipment, as well as a portion of personnel support for hiring student workers. A fund of \$9,700 will be matched to cover part of technician's salary (Budget breakdown is shown on a separate page).