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EVALUATION OF DROUGHT TOLERANCE IN FIVE NATIVE CARIBBEAN TREE SPECIES WITH LANDSCAPE POTENTIAL

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Abstract: Seedlings of five tree species native to the US Virgin Islands and Puerto Rico with potential for landscape plantings were grown in a greenhouse and subjected to 3 different watering intensities. We wanted to determine how fast nursery stock would reach an appropriate size for outplanting and how plant biomass would be allocated. Tree heights were measured weekly for 28 weeks after which trees were harvested to determine root, stem, and leaf weights. All species survived under the different watering regimes but had different responses in both height growth and biomass allocation. Only one species, *Andira inermis*, if subjected to abundant watering reached outplanting height by the end of 28 weeks. *Plumeria alba* growth did not respond positively to increasing water and field capacity was wasteful of water. In terms of biomass allocation *A. inermis* was plastic in the allocation of biomass by dedicating more biomass to roots while under water stress and dedicating more biomass to stem wood when watered at field capacity. Other species, in particular, *Bucida bucera* did not change biomass allocation in response to watering levels. The results indicate that Virgin Island nursery managers can save water during growing of these species by controlling watering levels and still obtain marketable local trees. This research was supported from USGS-WRRI and USDA-McIntireStennis grants.

Keywords: drought tolerance, landscape plantings, native tree species, tropical dry forest, *Andira inermis, Bucida bucera*, *Jacquinia arborea*, *Pimenta racemosa, Plumeria alba*

MATERIALS AND METHODS

Five native tree species, *Andira inermis, Bucera bucida, Jacquinia arborea, Pimenta racemosa,* and *Plumeria alba* were grown in 11.4 L pots filled with a substrate of 50% Promix, 25% top soil and 25% sand (Figure 1.). There were 18 trees per species and each tree was assigned a treatment: 1L, 2L or 3.8 L of water per week (Figure 2). The pots and plants receiving 3.8L of water kept soil at field capacity or close to it. Field capacity is the ability of a soil to hold water. We calculated field capacity by subtracting the dry weight of a pot before watering and then the wet weight of the pot, after excess water has drained out. Tree heights were recorded weekly for 28 weeks. At the end of the experiment, 9 plants of all the species, except *P. alba* were harvested, dried, separated into its components and weighed (Figure 3). The data was statistically analyzed using JMP. Graphs were generated in Excel. The statistics of interest were: mean, ANOVA and Comparison of Mean. The P value is equal or less than 0.05.

RESULTS AND DISCUSSION

All species survived under the different watering regimes but had different responses in both biomass allocation and height. *A. inermis* is plastic in the allocation of biomass. It dedicated

more biomass to roots while under water stress and more biomass to stem wood when watered at field capacity (Figure 4). Other species, in particular, *Bucida buceras* did not change biomass allocation in response to watering levels (Figures 5) *J. arborea* and *P. racemosa* allocated more biomass to leaves (Figures 6, 7). In terms of height growth see Table 1. *A. inermis* continued height growth with 3.8L and 2L of water applied weekly but 3.8L was better. *B. buceras* grew the fastest, but growth stopped once the plant needed all the water to maintain its leaf area. *J. arborea* grew at the same rate if it received 3.8L or 2L. *P. racemosa* and *P. alba* growth did not respond positively to increasing water and field capacity was wasteful of water. However, *P. racemosa* needed more water than *P. alba* in order to keep its foliage from wilting.

Ideally, nursery managers want to produce trees ready for landscape planting in the least amount of time possible with the least amount of water. We discovered that *A. inermis* and *B. bucera* grew best when watered to 100 percent field capacity weekly, *J. arborea* and *P. racemosa* grew best when watered to 66 percent field capacity weekly and *P. alba* had similar growth rates regardless of irrigation regime. These relative differences are also reflected in total biomass. Growth and biomass allocation among treatments suggests that differences among species can be attributed to their relative drought tolerance and natural habitats. It would be worthwhile to continue evaluation of native tree species for landscaping uses by conducting this study with other tree species as well as with the same species grown in larger pots.

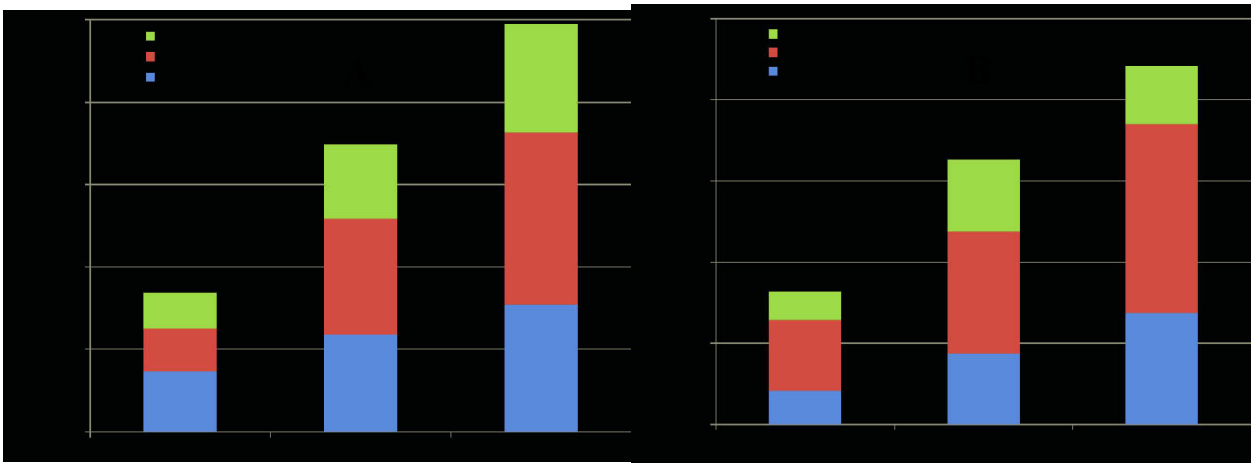

Fig. 1. Biomass production and allocation for *Andira inermis* (A) and *Bucida buceras* (B) by watering treatment.

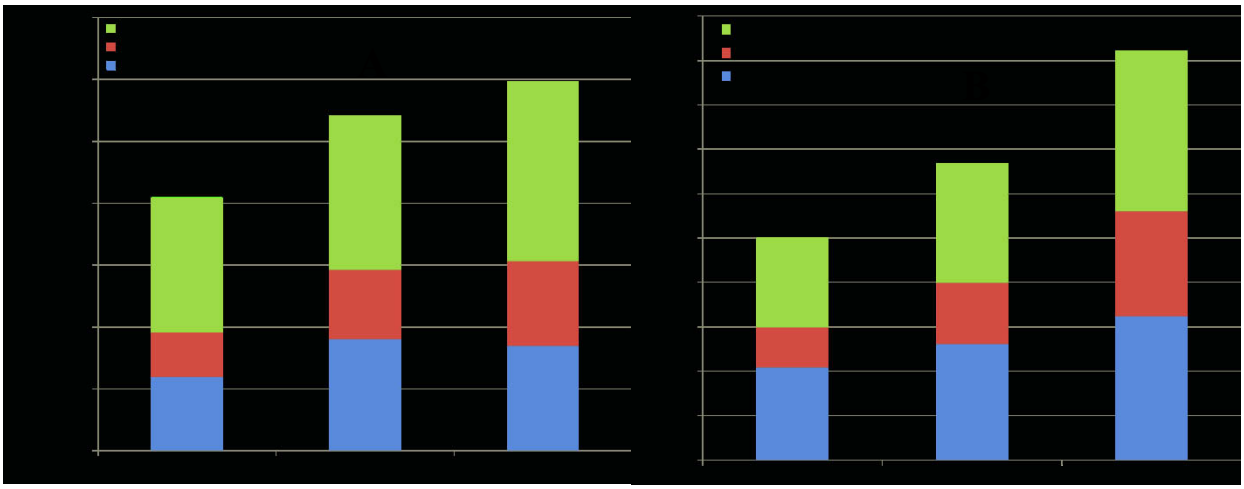

Fig. 2. Biomass production and allocation for *Jacquinia arborea* (A) and *Pimenta racemosa* (B) by watering treatment.

Table 1. Tree growth in height of five species and treatment of three watering regimes. Numbers followed by different letters within a species are significantly different P=0.05