United States Department of Agriculture

FINAL STUDY REPORT
Golden Meadow Plant Materials Center, Galliano, LA

Evaluating Techniques of Propagating Black Mangrove Vegetatively

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ABSTRACT

This study was conducted to identify a method to propagate Pelican Germplasm black mangrove (*Avicennia germinans*) vegetatively. Identifying the most time efficient and economically feasible method will benefit commercial growers' efforts to propagate successfully, and be able to reproduce black mangrove throughout the year without having to rely on seed. Three types of stem cuttings were utilized for the study. Stem cuttings were extracted from selected phenotypically attractive plants taken from 5 year old potted black mangrove. The 3 types of stem cuttings were First Year Growth, Second Year Growth and Mature Growth (> 4 Year). All 3 stem cuttings were subjected to 3 concentrations of rooting hormones (1:5 rooting hormone to parts water, 1:10 rooting hormone to parts water, and a 1:20 rooting hormone to parts water) and a control. None of the hormone treatments provided adequate rooting of any stems of black mangrove, but rooting, regardless of stem age or treatment did not occur until the 4th week of the study with peak rooting occurring in the 7th and 8th week. Vegetative propagation is a viable alternative to seed propagation and plans are to repeat the test in 2016 with modifications to stem size and age, and rooting periods.

INTRODUCTION

Black mangrove is a subtropical woody shrub that grows in salt marshes (Houck and Neill, 2009). Mangroves are very hardy and have become adapted to harsh environments where water and salinity levels fluctuate. Pneumatophores, also called air roots, form a network that collects silt and debris, and controls erosion. Black mangrove grows in the intertidal zone throughout the Gulf of Mexico. It will establish in nature from seed that floats and can travel some distance on the tides. Seed will germinate quickly and establish young seedlings in good habitat. Mangrove communities will often re-establish by natural volunteer propagule recruitment if natural hydrologic patterns are restored. Black mangrove may be propagated in the nursery from wild collected seed. Seed collected in the wild will not survive more than 3 to 4 weeks. Freshly collected seed should be soaked in water, the pericarp removed and the seed planted into pots using any type of commercial potting soil (Houck and Neil, 2009). Black mangrove seed is considered recalcitrant (unorthodox) meaning they do not survive drying and freezing during ex-situ conservation. In essence, the seed does not store for very long and loses viability quickly (USDA 2008).

Propagating black mangrove from stem cuttings may be a viable option for mass producing black mangrove for coastal restoration projects along the Gulf of Mexico. Propagation studies by Eganathan and Srinivasta (2001) suggest stem cuttings of mangroves (*Avicennia marina* and *Avicennia officinalis)* exposed to the correct concentration of rooting hormone can provide a means for vegetative propagation of this species. Therefore, the objective of this study is to evaluate different aged stem cuttings subjected

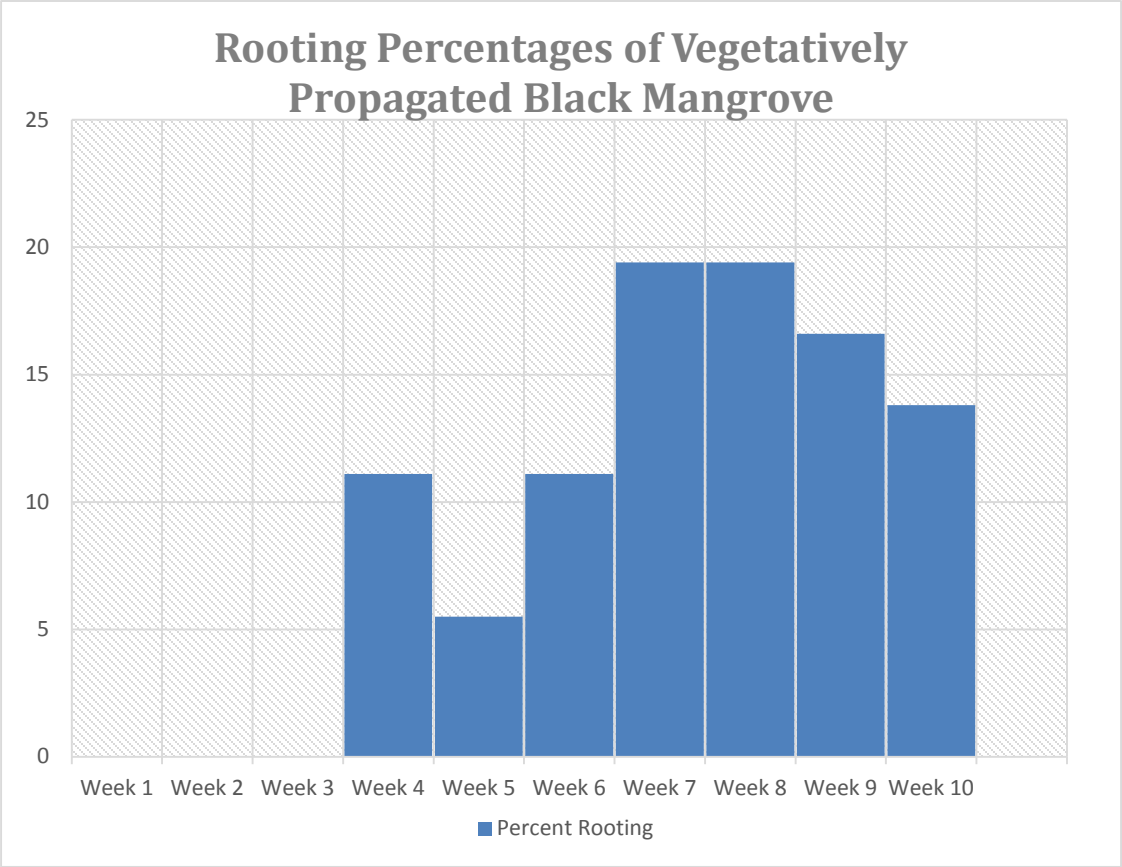
to different ratios of rooting hormone to parts water to determine their effectiveness to stimulate rooting of a black mangrove source from coastal Louisiana.

MATERIALS AND METHODS

The study was conducted in a greenhouse at the Golden Meadow Plant Materials Center in Galliano, LA. The greenhouse has a Quantum automatic watering system (Division of McConkey Co.) with water timings and settings assigned adequately for respective plant species. Stem cuttings and treatment methods used in this study were similar to Eganathan and Srinivasta, (2001). Stem cuttings were taken from approximately 5 year old healthy black mangrove plants maintained in greenhouses at the Center. Bypass pruning shears with Radial Arc© bypass blades (Corona Co.) were used to make the following cuttings. First year growth, second year growth and mature (> 4 years old). Cuttings ranged in lengths from 4 to 6 inches. 20" L x 14" W x 4" H, vented industrial tote trays (Edge Manufacturing Inc. Bluffton, Indiana) were chosen as the media containers. Media consisted of 50 % pine bark and 50 % peat moss (Sunshine Select Canadian Sphagnum) and were prepared initially before the cuttings were made. Plastic identification tags were made to distinguish cuttings and treatments and placed in plastic trays using random sequence generator. The study consisted of 3 treatments to be subjected to the 3 age cuttings. Treatments included are as follows: A 1:5 rooting hormone to parts water, 1:10 rooting hormone to parts water, and 1:20 rooting hormone to parts water and a control. Rooting hormone used is commercially labeled as Dip'N Grow® Liquid Rooting Concentration (Dip'N Grow, INC Clackamas, Oregon). Treatment levels used were according to the Dip'N Grow label. Treatment solutions were prepared in sterile glass beakers and basal stem cuttings were dipped into respective solutions for 3 to 5 seconds, as followed by label, then immediately placed in growing media. 120 stems for each age growth were needed for the study (360 total stem cuttings). Once the plastic trays were labeled and planted, the trays were placed randomly in the greenhouse receiving 82 +/- degree night temperature and 98 +/- degree day temperature. Adequate watering conducted by the Quantum automatic irrigation system was performed several times a day. The irrigation program was set so the entire study received the same amounts of water. Presence of roots were taken every 7 days at random, using random sequence generator. Samples were carefully removed from media using a kitchen fork and presence or absence of roots were recorded. Data collection began in June and ended in August with a total of 10 sets of observations of rooting taken every 7 days.

RESULTS AND DISCUSSION

Rooting did not occur until the 4th week after planting, regardless of stem age or treatment. The highest percentage of plants exhibiting rooting occurred in the 7th and 8th week (19.4%). Overall, there was a relatively low percentage of rooting that occurred, but the study did show a pattern of peak percentage rooting before time of root percentage decline (See Graph). Eganathan and Srinivasta (2001) used *Avicennia marina* and *Avicennia officinalis* in their vegetative propagation of mangrove. This study was conducted in a higher degree and would probably distract commercial growers due to the time consumption and costliness of the propagation procedures. However, Eganathan and Srinivasta (2001) found the optimum concentration of root-promoting hormone used in air-layering for maximum rooting to be 2500 ppm for *Avicennia marina* and 2000 ppm for *Avicennia officinalis*. The two species had 42 and 54 percent rooting, respectively. Rooting hormone used in their study was Indole Butyric Acid (IBA), one similar to the hormone in this study. Their study also revealed optimum concentration of hormones for maximum rooting in the stem cuttings for *Avicennia marina* (IBA concentration 2000 ppm) to produce 56 % rooting. In Eganathan and Srinivasta, (2001), study, rooting data was taken 40 to 60 days after the stems were planted. In the Golden Meadow PMC study, stems were examined for roots every week for 10 weeks, which was when the percentages of rooting was on a steady decline.



CONCLUSION

None of the stem ages or hormone concentrations provided satisfactory results for making recommendations for propagating black mangrove from stem cuttings. However, it wasn't until the 4th week before any rooting occurred, regardless of stem age or treatment, and peak rooting occurred in the 7^{th} and 8^{th} week. Vegetative propagation is considered a viable alternative to seed propagation and therefore, further studies are planned using similar hormone treatments with slight modification to stem size and age and rooting periods.

LITERATURE CITED

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