Propagation of Four Florida Coastal Dune Species by Stem Cuttings©

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INTRODUCTION

Coastal dunes and beaches comprise between 2800 to 4800 km of seashore in the five Gulf states, Georgia, and Puerto Rico. Use of plants to control dune erosion along this seashore is a high priority of Natural Resource Conservation Service plant materials programs. In addition to the high demand for coastal species used in dune restoration and stabilization projects, demand is increasing for transplants to address the needs of developers, homeowners, municipalities, nurserymen, and landscapers as development accelerates near coastal areas.

Commercial propagation protocols for these four species are lacking while the commercial demand for a diversity of coastal species has increased following hurricane activity. The objectives of this project were to determine the optimum auxin treatment and concentration for the propagation of the four coastal dune species False rosemary (*Conradina canescens* Gray [Lamiaceae]), Atlantic St. Johnswort (*Hypericum reductum* (Svens.) P. Adams [Clusiaceae]), gulf bluestem (*Schizachyrium maritimum* Chapman (Nash) [Poaceae]) and seacoast marshelder (*Iva imbricata* Walter [Asteraceae]). Use of these four species as drought tolerant landscape species may also help to diminish water and fertilizer use in landscapes of coastal developments.

MATERIALS AND METHODS

Softwood cuttings for all four species were collected on 21 July 1997 from Santa Rosa Island, Florida, a coastal barrier island (30N 18'N, 87N 16'W), placed in plastic bags, and stored in a cooler for transport. Prior to treatment, cuttings were cut to a length of 10 cm and the foliage was removed from the basal 1 cm of each cutting. Treatments were based on three auxin sources (Table 1): NAA (α-naphthaleneacetic acid), IBA (indole-3-butyric acid), and Dip'N Grow (Dip 'N Grow, Inc., Clackamas Oregon 97015-1888), a commercially available liquid formulation containing NAA and IBA. NAA and IBA were each dissolved in isopropyl alcohol to prepare 10,000 ppm stock solutions for further dilution with distilled water. Dilution ratios of Dip'N Grow were based on label recommendations.

The basal 1 cm of each cutting was treated with an auxin solution for 1 sec followed by 15 min of air drying prior to insertion to a 2 cm depth in 72-cell nursery flat inserts containing a medium of Fafard Mix #2 (Conrad Fafard, Inc., Agawam, Massachusetts 01001). Intermittent mist operated 6 to 8 sec every 10 min from 7:00 to 20:00 daily and cuttings were maintained under natural photoperiod.

Atlantic St. Johnswort. Softwood cuttings of Atlantic St. Johnswort were prepared from 10 cm nonbranched terminal shoots. The experiment was terminated after 4 weeks and percent rooting, root number, and length of the five longest primary roots >1 mm recorded (Table 2).

Table 1. Active ingredient and concentration of auxin treatments used to propagate four coastal dune species.

Auxin treatment	Active ingredient (ppm)	
	α-naphthaleneacetic acid	Indole-3-butyric acid
No auxin	0	0
IBA 1000[1]	1000	0
IBA 5000	5000	0
NAA 500[1]	0	500
NAA1000	0	1000
NAA 5000	0	5000
Dip'N Grow (1:19)[2]	500	250
Dip'N Grow (1:9)	1000	500

[1]Liquid formulations prepared by dissolving the respective acids in 500 ml isopropyl alcohol to create a 10,000 ppm stock solution and further diluting with distilled water.
[2]Commercially available liquid formulation, diluted with distilled water.

Table 2. Effects of rooting hormones on rooting percentage, root number, mean root length, and root dry weight of Atlantic St. Johnswort (*Hypericum reductum*).

Auxin treatment (ppm)	Rooting (%)	Root (no.)	Mean root length (cm)	Root dry weight (mg)
No auxin	72 bc[1]	6 d	3.0 cd	8.2 bcd
IBA 1000	89 a	8 cd	3.9 ab	9.6 bc
IBA 5000	94 a	14 a	4.5 a	10.0 abc
NAA 500	83 ab	7 cd	2.8 cd	7.1 cd
NAA 1000	92 a	10 b	2.6 d	9.2 bc
NAA 5000	61 c	6 d	0.9 e	5.4 d
Dip'N Grow 1:19	89 a	10 bc	4.0 ab	10.8 ab
Dip'N Grow 1:9	94 a	11 b	3.4 bc	12.8 a
LSD (a = 0.05)	16	2	0.8	2.9

[1]Means within a column followed by the same letter do not differ (P = 5%).

False Rosemary. Softwood cuttings of false rosemary were prepared from the terminal 10 cm of non-branched shoots. Auxin treatments included IBA and NAA (Table 1). The experimental design was a randomized complete block with six cuttings per auxin treatment and six replications. The experiment was terminated after 4 weeks and percent rooting, root number, length of the 5 longest primary roots >1 mm, and root dry weight recorded (Table 3).

Gulf Bluestem. Typical softwood cuttings of gulf bluestem were prepared from terminal shoots representing the first 20 cm of each shoot. These shoots were bisected to produce 10-cm cuttings with the distal portions (terminal bud intact) and proximal portions segregated. No foliage was removed from the base of the cuttings. Auxin treatments included IBA at 1000 or 5000 ppm and a nontreated control. The experimental design was a split-plot design with cutting type allocated to main plots and auxin treatments allocated to subplots. There were two cutting types (proximal and distal) and three auxin treatments with six cuttings per treatment and six replications. The experiment was terminated after 2 weeks and percent rooting, root number, length of the 5 longest primary roots ≥1 mm, and tiller number were recorded (Table 4).

Seacoast Marshelder. Softwood cuttings were prepared from the uppermost 10 cm of nonbranched terminal shoots. The shoots below the 10 cm terminals typically contained many short branches. These short shoots, each containing an intact terminal bud, were utilized to prepare an additional group of cuttings 5 cm in length. Auxin treatments included IBA at 1000 or 5000 ppm and a nontreated control. There were two cutting types (10 cm and 5 cm) and three auxin treatments with six

Table 3. Effects of rooting hormones on rooting percentage, root number, mean root length and root dry weight of false rosemary (*Conradina canescens*).

Auxin treatment (ppm)	Rooting (%)	Root (no.)	Mean root length (cm)	Root dry weight (mg)
No auxin	86 bc[1]	10 c	1.9 c	5.8 b
IBA 1000	100 a	13 bc	3.2 ab	7.8 ab
IBA 5000	92 abc	13 bc	3.0 ab	7.7 ab
NAA 500	100 a	18 a	3.1 ab	9.4 a
NAA1000	100 a	13 bc	2.7 abc	8.4 ab
NAA 5000	83 c	13 bc	2.4 bc	10.3 a
Dip'N Grow (1:19)	89 abc	13 bc	2.8 ab	9.1 ab
Dip'N Grow (1:9)	97 ab	14 b	3.5 a	9.8 a
LSD (a = 0.05)	11	4	0.9	3.5
Dip'N Grow (1:9)	97 ab	14 b	3.5 a	9.8 a
LSD (a = 0.05)	11	4	0.9	3.5

[1]Means within a column followed by the same letter do not differ (alpha = 5%).

cuttings per treatment and six replications. The experiment was terminated after 3 weeks and percent rooting, root number, length of the five longest primary roots ≥1 mm, and number of branches were recorded (Table 5).

RESULTS

Our studies suggest each of the four coastal dune species could be rooted at high percentages without the application of a rooting compound containing the auxins IBA or NAA. However, the addition of an auxin did improve root quality measures for false rosemary, Atlantic St. Johnswort, and seacoast marshelder.

PRACTICAL IMPLICATIONS

Attention to grading cuttings based on the developmental stage of cutting material for seacoast marshelder and gulf bluestem is important for maintaining uniformity in cutting production and subsequent transplant production. Rooting and transplant quality of gulf bluestem was improved through selection of older cutting material. Cuttings from the proximal end of above ground shoots are utilized to ensure mature nodes are present. A greater number of nodes for shoot and root production are available within this region of the plant because of the short internodes.

Table 4. Effects of Indolebutyric-3-acid on rooting percentage of seacoast marshelder (*Iva imbricata*).

Indole-3-butyric acid	Cutting type		5 cm vs. 10 cm
(ppm)	5 cm	10 cm	*P Value*
0	83 b[1]	94 a	*0.0756*
1000	100 a	97 a	*0.6557*
5000	81 b	97 a	*0.0080*
Significancence	*P value*		
Cutting type	*0.0213*		
Auxin	*0.0405*		
Cutting type * Auxin	*0.0774*		

[1]Means within a column followed by the same letter do not differ (α = 5%).

Table 5. Effects of indolebutyric acid (IBA) on rooting percentage of gulf bluestem (*Schizachyrium maritimum*).

Indole-3-butyric acid	Cutting type		Distal vs. proximal
(ppm)	Distal	Proximal	*P value*
0	16 b[1]	82 a	*0.0001*
1000	29 a	76 a	*0.0001*
5000	34 a	76 a	*0.0001*

[1]Means within a column followed by the same letter do not differ (α = 5%).

Production schedules for these species in the spring and summer months are very similar. Cuttings are stuck in a pinebark-based substrate using 72 cell trays and roots initiate within 2 to 3 weeks. Rooted cuttings are removed from the mist on week 3 or 4 and the plants remain in these flats through weeks 5 to 6. Seacoast marshelder and false rosemary may be pruned in weeks 4 or 5 prior to transplant or within 1 week after transplant to initiate branching. Gulf bluestem and Atlantic St. Johnswort, in general, will not require pruning. Following transplant into 1-liter (4-inch) pots, plants require an additional 4- to 6-week production period to achieve a full rootball and a canopy of approximately 15 to 20 cm.

Benefits of Shade During Production of *Illicium*: Optimizing Growth and Nutrient Recovery©

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We conducted a study to elucidate the optimal light intensity for growth and nutrient recovery for two taxa of *Illicium*. Plants were grown under three light treatments, 45%, 70%, and 100% of full sun using standard nursery practices. Growth indices, final dry mass, and SPAD chlorophyll meter readings were taken at the conclusion of the experiment. Tissue analysis for N, P, and K were conducted to determine percent recovery of applied nutrients. Growth and SPAD readings for *I. floridanum* Ellis. 'Pebblebrook' decreased as light level increased from 45% to 100% of full sun. *Illicium parviflorum* Michx. ex. Vent. 'Forest Green' growth also decreased as light level increased, but SPAD readings were unaffected. For both taxa, optimum nutrient uptake of nitrogen, phosphorus, and potassium occurred in the 45% light treatment. To improve production efficiency of container-grown *Illicium* taxa we recommended growers produce *Illicium* taxa in light intensities of less than full sun.

INTRODUCTION

Light intensity during production of container-grown ornamentals not only affects growth rates for specific plants, but also overall plant quality. This is of particular importance for broad-leaf evergreens, where growth in high light intensities may lead to photobleached and chlorotic foliage (Andersen et al., 1991a; 1991b) from prolonged photoinhibition (Lambers et al., 1998). *Illicium*, or star-anise, is a popular genus of broad-leaf evergreens trees and shrubs native to parts of southeastern Asia and southeastern North America and Mexico (Smith, 1947). Currently, many nurseries in the southeastern U.S.A. grow *I. parviflorum* in full sun and *I. floridanum* in shade.

Olsen and Ruter (2001) compared photosynthetic rates of various *Illicium* taxa grown in 100% or 45% of full sun, with maximum rates of photosynthesis occurring in the 45% light treatment. *Illicium parviflorum* 'Forest Green' maintained similar rates of photosynthesis in 100% light as in the 45% light treatment; however, they predicted that maximum growth would occur for this taxon in 45% light where