Rooting of 'Brown Velvet' Southern Magnolia Stem Cuttings as Influenced by Medium and Auxin Treatment[1]

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Abstract

Terminal stem cuttings of 'Brown Velvet' Southern magnolia (*Magnolia grandiflora* L. 'Brown Velvet') were treated with 0.3% indole-3-butyric acid (IBA) in talc, or 0.5% naphthaleneacetic acid (NAA) quick dip + 0.3% IBA in talc, or 0.5% NAA + 1.0% IBA quick dip. Rooting media included pine bark, perlite, or combinations of bark and perlite at the following ratios: 3:1, 1:1, 1:3 (by vol). Cuttings were rooted in a greenhouse mist bed supplied with bottom heat. Rooting percentage was unaffected by media with the exception of a decreased response in perlite. Root length and secondary root formation was greater with pine bark than with perlite, while the bark/perlite blends provided an intermediate response. Increased auxin concentrations produced more primary roots but reduced formation of secondary roots. However, rooting percentage was not affected by auxin treatment. Results suggest that medium selection is more important than auxin source or delivery method in the rooting of 'Brown Velvet' Southern magnolia.

Index words: adventitious rooting, asexual propagation, pine bark, perlite, indole-3-butyric acid, naphthaleneacetic acid.

Growth regulators used in this study: indole-3-butyric acid (IBA), naphthaleneacetic acid (NAA).

Species used in this study: 'Brown Velvet' Southern magnolia (*Magnolia grandiflora* L. 'Brown Velvet').

Significance to the Nursery Industry

Increasing demand for named cultivars of Southern magnolia has resulted in the use of stem cuttings for large scale cloning. However, propagators have many choices with regard to rooting medium, auxin source, and auxin delivery method. Identification and adoption of cultural practices important in the rooting of Southern magnolia cultivars will result in efficient and reliable production of rooted cuttings.

Introduction

The genus *Magnolia* is composed of over 200 species ranging from temperate to tropical and from deciduous to evergreen (1). Many of the temperate species are utilized as landscape plants throughout the United States. Southern magnolia (*Magnolia grandiflora* L.) is found commonly in the southeastern U.S. It is a highly desirable landscape plant due to its form and other attractive features.

Traditionally, seed has been used for large scale propagation of Southern magnolia. Because seedlings exhibit a wide range of phenotypic characteristics, selections have been made for hardiness, growth habit, and features such as leaf shape, large flowers, and dark colored, textured leaf undersides (5). Through this process new cultivars have been introduced to the trade that landscape architects, landscape designers, and other industry professionals are becoming more aware of and requesting in larger numbers. Increased demand from industry for named cultivars has resulted in use of stem cuttings for large scale cloning.

As the number of Southern magnolia cultivars has increased, so have the variations in techniques used to root stem cuttings. Pure vermiculite and perlite have been used as rooting media but tend to produce roots that are tender or brittle, and thus easily damaged during transplanting (3,5). Such damage can retard subsequent plant growth (6). Sand + perlite and sand + pumice have been tested (4), but poorly drained media can result in reduced rooting.

Variations also exist among propagators with regard to auxin source and delivery method. NAA at 0.5–1.0% and IBA at 0.5–2.0% have been recommended in a carrier of 50% ethanol (5, 8). A talc formulation of IBA (0.8%) has also been recommended (4). Supraoptimal auxin levels inhibit apical bud development (7).

To commercially produce cultivars of Southern magnolia, problems associated with their propagation must be overcome (2). The purpose of this study was to evaluate the effects of medium and auxin treatment on rooting of 'Brown Velvet' Southern magnolia.

Materials and Methods

Terminal stem cuttings of 'Brown Velvet' Southern magnolia were collected on August 27, 1990. Cuttings were 15 cm (6 in) long. The terminal bud was formed and all leaves had expanded completely. Leaves were removed from the basal 5 cm (2 in) of each cutting, and the basal 2.5 cm (1 in) received two heavy wounds with a grafting knife (penetrating cambium) on opposite sides of the stem. Cuttings were then treated with auxin, stuck in 35 × 51 × 10 cm (14 × 20 × 4 in) flats filled with media, and placed in a poly-covered greenhouse at ambient light levels. Day/night temperatures were maintained at 29/16C (85/60F). Intermittent mist was provided as needed, and contained Agribrom (Great Lakes Chemical Corp., West Lafayette, IN) at 5–7 ppm to reduce pathogens and algal growth. Bottom heat at 24C (75F) was supplied by a Biotherm system. All cuttings were treated with Benlate or Manzate as needed.

Auxin treatments included 0.3% indolebutyric acid (IBA) in talc, 0.5% naphthaleneacetic acid (NAA) in 50% ethanol as a 5 second quick dip followed by 0.3% IBA talc, and a commercial, liquid formulation of 0.5% NAA + 1.0% IBA (Dip'N Grow, ALPKEM Corp., Clackamas, OR) as a 5 sec-

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Table 1. Effect of medium on rooting of stem cuttings of 'Brown Velvet' Southern magnolia.

Medium	Volume ratio	Rooting (%)	Root length[z] (cm)	Secondary root formation[y]
Pine bark	—	78.8a[x]	13.8a	3.0ab
Pine bark/perlite	3:1	81.8a	12.9ab	3.2a
Pine bark/perlite	1:1	82.9a	12.4bc	3.0ab
Pine bark/perlite	1:3	79.1a	11.4c	2.7b
Perlite	—	68.0b	9.0d	2.1c

[z]Root length = 1/2 maximum rootball diameter.

[y]Visual rating from 1 to 5 where 1 = no secondary roots and 5 = secondary roots on 100% of primary roots.

[x]Means within columns followed by the same letter are not significantly different at the 0.05 level according to Duncan's New Multiple Range Test.

Table 2. Effect of auxin on rooting of stem cuttings of 'Brown Velvet' Southern magnolia.

Auxin treatment	No. of primary roots/ cutting	Secondary root formation[z]
0.3% IBA in talc	4.1c[w]	3.0a
0.5% NAA quick dip + 0.3% IBA in talc[y]	5.0b	2.7b
0.5% NAA + 1.0% IBA quick dip[x]	5.7a	2.7b

[z]Visual rating from 1 to 5 where 1 = no secondary roots and 5 = secondary roots on 100% of primary roots.

[y]NAA dissolved in 50% ethanol.

[x]DIP'N GROW formulation, ALPKEM Corp., Clackamas, OR.

[w]Means within columns followed by the same letter are not significantly different at the 0.05 level according to Duncan's New Multiple Range Test.

ond quick dip. These treatments were selected based on commercial availability and results from preliminary trials conducted over the previous two years. Media treatments consisted of 100% pine bark [maximum particle size: 1.6 cm (0.6 in)], 100% perlite, and bark/perlite blends at the following ratios: 3:1, 1:1, 1:3 (by vol). Media contained Osmocote (18–6–12, The Scotts Co., Marysville, OH) at 3.9 kg/m^3 (6.5 lb/yd^3) and S.T.E.P. (soluble trace element package, Scotts) at 0.9 kg/m^3 (1.5 lb/yd^3). Flats were arranged in a randomized complete block design containing 5 blocks and a 3 × 5 factorial arrangement of treatments with 24 cuttings per treatment per block, for a total of 1800 cuttings.

Cuttings were removed from the flats on March 29, 1991, and were evaluated for: root number per cutting, root length (1/2 maximum rootball diameter), degree of secondary root formation (visual rating on a scale from 1 to 5 where 1 = no secondary roots and 5 = secondary roots on 100% of primary roots), and rooting percentage. With the exception of rooting percentage, ratings included only those cuttings that rooted.

Data were subjected to analysis of variance (ANOVA) using Statistical Analysis System software (SAS Institute, Inc., Cary, NC). Mean separations were performed using Duncan's New Multiple Range Test at the 0.05 level.

Results and Discussion

Data analysis revealed a lack of interaction between rooting factors, so results due to media and auxin effects are presented separately.

All media containing pine bark produced higher rooting percentages than perlite alone (Table 1). Data for secondary root formation followed a similar trend. Root length in pine bark and pine bark/perlite (3:1 by vol) exceeded that in perlite and pine bark/perlite (1:3 by vol). However, media did not affect root number (data not shown). Data suggest that pine bark is more effective than perlite in promoting root development of 'Brown Velvet' Southern magnolia cuttings.

When rooted cuttings were removed from perlite, their roots were noticeably brittle and easily damaged during repotting, as observed previously (5). An additional disadvantage of perlite is its high cost in comparison with pine bark.

Rooting percentage (76–80%) and root length were not affected by auxin treatment. The 0.5% NAA + 1.0% IBA quick dip produced the highest number of roots (Table 2). Although the 0.3% IBA in talc produced the lowest number of primary roots, it had the highest level of secondary root formation.

The 0.5% NAA + 1.0% IBA quick dip treatment resulted in the highest number of primary roots per cutting, whereas the IBA in talc resulted in the greatest formation of secondary roots. It is possible that an inverse relationship exists between the numbers of primary and secondary roots formed on a per cutting basis. Further research is needed to determine which parameter is more significant in the subsequent growth of cuttings. However, since high auxin levels can inhibit subsequent bud growth and development, the lower auxin level of the talc treatment may be less detrimental to buds than the quick dip.

Wounding did not appear to be beneficial. Most roots initiated from the proximal 1 cm (0.4 in) of stems. The few roots that developed above that point originated mostly from the non-wounded areas.

Rooting of 'Brown Velvet' Southern magnolia stem cuttings can be accomplished using a wide range of media and hormone treatments. However, results suggest that rooting response is greater in 100% pine bark or a pine bark/perlite blend than in 100% perlite.

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