The Controversy Continues: Comparisons of Propagation Techniques of *Magnolia grandiflora*

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INTRODUCTION

Southern magnolia (*Magnolia grandiflora)* is prized for landscaping due to its lustrous, evergreen leaves and large, fragrant flowers. In the past, southern magnolia was traditionally propagated from seed. Seedlings exhibit highly variable growth characteristics. Selections have been made for hardiness, growth habit, leaf shape, large flowers, and dark-colored, textured leaf undersides (Dirr, 1990). Named cultivars are recognized by landscape architects and designers, and are being requested in increasingly larger numbers. This increase in demand has made it necessary to utilize asexual propagation techniques (Berry, 1991). These techniques include rooting, budding, grafting, and tissue culture. Each of these techniques has certain advantages and disadvantages. The purpose of this paper is to address the advantages and disadvantages of each of these techniques and to present rooting results on southern magnolia.

Controversy in Propagating Southern Magnolias. Rooting southern magnolia has been a controversial process. Every propagator has their own preference for rooting medium, auxin source and application method. Vermiculite and perlite have been used as rooting media but tend to produce tender or brittle roots that are easily damaged during transplanting (Brailsford, 1993; Dirr, 1990), which can retard subsequent plant growth (Dirr and Heuser, 1987). Sand, perlite : sand, and pumice have been used (Curtis, 1981), but poor drainage can result in reduced rooting. My preference is pine bark and perlite.

Propagators also vary widely in their use of auxin source and delivery method. Naphthaleneacetic acid (NAA) at 0.5% to 1.0% and quick-dips of indole-3-butyric acid (IBA) at 0.5% to 2.0% have been used with 50% ethanol (Dirr, 1990; Stadtherr, 1967). A talc formulation of IBA (0.8%) has also been used (Hartmann, et al., 1990).

The purpose of this study was to evaluate the effects of auxin treatment and media on rooting of *M. grandiflora* 'Brown Velvet'.

MATERIALS AND METHODS

Terminal, hardwood cuttings 15 cm (6 in.) long were collected 27 August 1990. Leaves were removed from the basal 5 cm (2 in.) of each cutting. The cuttings received two heavy wounds 2.5 cm (1 in.) long on opposite sides of the stem. Cuttings were treated with auxin and stuck in 36 cm × 51 cm × 10 cm (14 in. × 20 in. × 4 in.) flats filled with media, then placed in a poly-covered greenhouse with average day/night temperatures of 27C (80F)/16C (60F). Intermittent mist was provided as needed and contained the bromicide, Agribrom, at 5 to 7 ppm to reduce pathogens. Bottom heat at 24C (75F) was supplied by a Biotherm system. All cuttings were treated with the fungicides—Benlate or Manzate as needed.

Auxin treatments included 0.3% IBA in talc, and 0.5% NAA in 50% ethanol as a 5-sec quick-dip plus 0.3% IBA in talc, and a 5-sec quick-dip of full-strength Dip

'N Grow (1.0% IBA and 0.5% NAA). These treatments were selected based on rooting trials from the previous 2-years.

Media treatments consisted of 100% pine bark, pine bark and perlite (3 : 1, v/v), pine bark and perlite (1 : 1, v/v), pine bark and perlite (1 : 3, v/v), and 100% perlite. Media contained 3.9 kg m^{-3} (6.5 lb yd^{-3}) Osmocote (18N-6P-12K), and 0.9 kg m^{-3} (1.5 lb yd^{-3}) S.T.E.P. (soluble trace element package, Scotts Co.). Flats were arranged in a completely randomized design, and 1800 cuttings were used in the experiment.

Cuttings were removed from the flats on 29 March 1991 and evaluated for: root number per cutting, root length (50% maximum rootball diameter), degree of secondary root formation (visual rating on a scale of 1 to 5 were 1 = no secondary roots and 5 = highest number of secondary roots), and rooting percentage.

Data were collected and subjected to ANOVA and mean separation was by Duncan's new multiple range test.

RESULTS AND DISCUSSION

There was no interaction among rooting factors, so results due to media and auxin effects are presented separately.

All pine bark media produced higher rooting percentages than perlite alone (Table 1). Data for root length and secondary root formation followed a similar trend. Media did not affect root number (data not shown). Data suggest that pine bark

Table 1. Effect of media on rooting of stem cuttings of *Magnolia grandiflora* 'Brown Velvet'.

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

Table 2. Effect of auxins on rooting of stem cuttings of *Magnolia grandiflora* 'Brown Velvet'.

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

[z] Root length = 50% maximum rootball diameter.

[y] Visual rating from 1 to 5 where 1 = no secondary roots and 5 = highest number of secondary 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.

is more effective than perlite in promoting root development of *M. grandiflora* 'Brown Velvet' cuttings. Cuttings rooted in perlite had more brittle roots and were easily damaged during repotting. Another disadvantage of perlite is its high cost in comparison with pine bark.

The 1.0% IBA + 0.5% NAA 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. Root length and rooting percentage (76% to 80%) were not affected by auxin treatment.

The 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. 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 0.3% auxin in talc may be less detrimental to buds than the quick-dip method with higher auxin concentration.

Wounding did not appear to be beneficial. Most roots initiated from the proximal 1.3 cm (0.5 in.) of the stems. The few roots that developed above that point originated mostly from the non-wounded areas.

Rooting *M. grandiflora* 'Brown Velvet' cuttings can be accomplished using a wide range of media and hormone treatments. However, it appears that a 100% pine bark medium and either 0.3% IBA in talc or 1.0% IBA + 0.5% NAA quick-dip are the preferred treatments. Asexual propagation is a feasible means of propagating *M. grandiflora* cultivars while maintaining their desirable characteristics.

Review of Commercial Propagation Practices. Southern magnolia can be propagated successfully by several techniques. Each propagator has reasons to utilize one or more of these techniques. Each propagator must evaluate their resources to determine which techniques are best suited to their production schedule. At Taylor's Nursery, Inc., we utilize budding and rooting because these techniques work the best in our propagation schedule.

Comparison of Propagation Techniques. The following is a listing of advantages and disadvantages of various propagation techniques for southern magnolia.

Rooting Advantages and Disadvantages:

- Highly skilled labor is not needed.
- Cultivar characteristics are maintained.
- Cold-hardy cultivars will have cold-hardy root systems.
- Bottom heat is needed and is costly.
- Many cultivars root in very low percentages.
- A large number of stockblock plants is needed due to the large quantity of propagules required.
- Heated greenhouses are needed, which makes greenhouse space more costly.

Budding Advantages and Disadvantages:

- Plants often bloom heavily the first year.
- Plants tend to branch very densely as compared to other propagation techniques.
- Vigorous rootstock systems produce larger plants more quickly.
- Budding percentage is usually very high—even on cultivars that are very difficult to root.

- A large number of stockblock plants is <u>not</u> needed, due to more efficient utilization of propagule units (i.e. from dormant containerized plants or stockplants, quite a few buds can be taken from each section of scion wood).
- Greenhouse space is not needed.
- Crop is usually very uniform.
- Highly skilled labor is needed — which is often not available and quite costly.
- Vigorous rootstock may alter scion cultivar characteristics.
- Rootstock will sucker and must be maintained.

***Grafting Advantages and Disadvantages*:**

- Vigorous rootstock system produces larger plants more quickly.
- Grafting percentage is usually high.
- Highly skilled labor is needed — which is often not available and quite costly.
- Vigorous rootstocks may alter cultivar characteristics.
- A large number of stockblock plants is needed due to the large quantity of propagules required.
- Heated greenhouses are needed, which makes greenhouse space more costly.
- Plants tend to branch less densely, compared to other propagation techniques.
- Rootstock will sucker and must be maintained.

Tissue Culture Advantages and Disadvantages:

- Cultivar characteristics are maintained.
- A large number of new plantlets can be produced from a limited number of stockplant sources, and subculturing can be done to bulk-up plant numbers.
- Cold-hardy cultivars will have cold-hardy root systems.
- Growth rate is often slow for the first year.
- Very costly laboratory facilities are needed.
- Highly skilled labor is needed — which is often not available and quite costly.

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