Magnolia grandiflora: A propagation guide

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by Dr. Michael A. Dirr and Beth Brinson

Magnolia grandiflora (Southern magnolia) qualifies as one of the aristocrats of American trees. It is difficult to imagine a Southern college campus or large-scale landscape without *M. grandiflora.*

From May to July, the air of the University of Georgia campus in Athens is heavy with the heady perfume produced by the large tree's white flowers. In September the bright red seeds push their noses through each zipperlike pocket on the aggregate fruits and dangle from silklike threads. Unfortunately, the fruits abscise later in fall and create an absolute mess.

Magnolia grandiflora displays tremendous diversity of leaf color, size, shape and pubescence (hairiness that gives the underside of leaves their brown appearance). Habit is also quite variable, ranging from almost columnar to broad-spreading. The opportunities for selection of superior types are tremendous, and, recently, Pounders (17) presented a list of 16 *Magnolia grandiflora* cultivars. We have unearthed 11 additional cultivars that did not appear on Pounders' list.

There is little doubt that the list of *M. grandiflora* cultivars will continue to grow as nurserymen move toward superior selections. The reasons for this trend are obvious. Seed-grown trees are extremely variable in ornamental characteristics, habit and growth rate (2,5,14,17). A block of seed-grown trees is seldom sold out because of the large number of culls.

Cultivars offer uniformity in both the production cycle and the sales phase. Landscape architects and designers are becoming more sophisticated and demanding in their specifications. They want trees that have specific landscape characteristics: uniformity of habit; excellent foliage color, flowering and fall color; desirable growth rates; and so on.

Growers who supply uniform quality nursery stock will discover a tremendous market for their products. Many realize this and have made selections of *M. grandiflora* (17). The plants are commonly propagated by three methods: cutting; grafting or budding; and from seeds.

Propagating *M. grandiflora* from cuttings is not easy or reliable, and the literature is full of data describing successes and failures. Successful propagation by cuttings is feasible if certain steps are followed. Rates of rooting as reported in the literature and by nurserymen and researchers range from 0 to 100 percent (4,6,16,19,21).

Grafting and budding are practiced by some companies that produce *M. grandiflora* (11,12,13,21). They feel safer with grafting because this method yields an 80 percent (or greater) return of salable plants. However, labor costs and the time required make this kind of production expensive.

For rootstocks, seedling production is necessary. Propagation of *M. grandiflora* from seed is easy if a few specific procedures are followed.

Seeds

Fruits should be collected when the red seeds have emerged from the cone-like structures, which are actually aggregates of follicles. Each follicle contains one seed attached by a slender, threadlike structure called a funicular stalk. Fruits can be air dried until all seeds have emerged. Seeds can then be easily removed.

Trees often produce fruit 10 years after planting and bear good crops annually thereafter. A 6 year old tree in Dirr's yard has produced fruit. Fruits from superior and isolated trees should be chosen to ensure more uniform, vigorous seedlings.

M. grandiflora seeds are covered by a soft, oily, fleshy coat called an aril. The aril should be removed because it contains germination inhibitors (8,15). A pound of cleaned seed contains 5,800 to 6,800 seeds.

Seeds of Woody Plants in the United States (20) notes that seeds of most magnolias can be stored either cleaned or in the dried pulp (aril) for several years with little loss of viability when they are kept in sealed containers at 32° to 41°F.

Oily seeds, however, lose viability quickly if allowed to dry. Baciu (1) reported that *M. grandiflora* seed loses viability in 10 to 15 minutes if exposed to direct sunlight. He also noted that one pound of seed stored for five months at 32°F to 35°F produced more than 4,000 seedlings. Seed should be treated with a suitable fungicide if it is being stored.

Cold Stratification

Magnolia grandiflora seed germinates more uniformly and quickly if it is given a cold stratification period (7,20). Two to six months are commonly recommended, but two to three months are more than adequate to produce a germination rate of over 80 percent.

A maximum of 250 seeds should be planted per square foot of flat or bed space. Seeds should be covered with ¼ to ½ inch of soil. It is also wise to provide rodent protection, especially if the seeds are planted in outdoor beds.

Gage (7) reported that seed that had been stratified for two months at 40°F germinated in 27 days with bottom heat applied to the flats. Germination took 72 days without heat when the flats were placed in plastic-covered cold frames.

In Georgia work (unpublished), cleaned seeds were sown immediately with excellent germination four months later. The pulp was removed by placing the seeds in a Waring blender with water. (The blender blades were masked with Tygon plastic tubing or electrical tape.) Interestingly, Hillenmeyer (10) has germinated seeds on a commercial basis without using cold stratification.

M. grandiflora apparently has an undeveloped embryo (8,15) and requires a period of after-ripening in which the embryo completes development. Once this process is completed, germination can proceed.

Seedlings should be transplanted after three to four leaves have developed. Schneider (18) reported that is takes 17 months for a newly planted seedling in a 1 gallon container to produce a suitable rootstock (understock).

Grafting and Budding

Although seedlings of *M. grandiflora* would logically appear to be the most suitable rootstock for grafting or budding cultivars, there is ample evidence to suggest that *M. grandiflora* can be grafted on *M. kobus* (12) (a deciduous species). *M.*

grandiflora itself can serve as a rootstock for deciduous magnolias.

At the University of Illinois, McDaniel used *M. acuminata* (cucumber tree magnolia) as a rootstock for many magnolias. This species is particularly valuable because of its wide geographic native range and, perhaps, better adaptability to various soil and climatic conditions than *M. grandiflora.*

Wells (21) uses 2 year old, container-grown *M. grandiflora* seedlings for rootstocks. A modified side graft is used.

Scion wood, taken as 8 to 10 inch long terminal shoots, is collected in November. The foliage is removed, the wood is given a fungicidal dip, and the scions are stored in plastic bags at 38° to 40°F until they are used. All scions are used in three to four days.

A 2 inch long longitudinal cut is made at a depth approximating one quarter the diameter of the rootstock stem. Scions are cut the same length and matched with rootstock cuts. The grafts are wrapped, and then the plants are sprayed with Benlate and placed in a poly tent.

After the plants' terminal buds swell and break and plants have one or two fully opened leaves, they are moved and hardened.

In California (13), *M. grandiflora* cultivars are budded outdoors in early spring or summer (using container-grown rootstock). Commercial grafting and budding activities appear to be restricted to the West Coast (specifically, California).

In England, Knuckey (12) used shield and chip buds with a number of magnolias and experienced success rates of 75 to 95 percent from August to October in a greenhouse.

Itaya (11) used shield and T-buds on *M. grandiflora* in April in California with success rates as high as 95 percent.

Cuttings

Recently, cuttings have received considerable attention, and the literature is full of mixed results (3,4,16,19,21). Propagation by cuttings will doubtless gain in popularity, because, with the new research information, refinements are continually being made to increase rooting.

Several southeastern growers are rooting various cultivars from cuttings with moderate success. Enright (6), Curtis (3,4), and Stadtherr (19) were among the first to describe highly successful rooting using cuttings.

Working in Maryland, Enright used late spring and early summer cuttings with 1 inch wounds and stuck them in coarse bank sand. The cuttings received 10 second dips in solutions containing high levels of indolebutyric acid and alcohol, were given 70° bottom heat and were kept in a greenhouse.

An average of 86 percent of Enright's June cuttings rooted with treated with 20,000 parts IBA per million. Ten percent rooted when treated with IBA at 5,000 ppm. Cuttings that were not treated with the hormone did not root at all. Rooting time was 63 days. The age of Enright's stock plants was not presented in the research.

In Oregon (4), Curtis collected cuttings in early November. But he emphatically stated that once the terminal bud has set and the wood has firmed, cuttings should be collected. Heels, wood from the previous season's growth, were used as cuttings. Curtis' observations indicated that cuttings from species with large pith areas (like *M.*

grandiflora) root better if made as heel cuttings.

The experimental cuttings were 6 to 8 inches long with five to six leaves. A 1 to 1¼ inch long wound was made on one side. No leaf reduction was made. The cuttings were treated with IBA at 8,000 ppm (in talc) and stuck in a sand-pumice or sand-perlite mix in deep flats.

Cuttings were given 80° bottom heat but no mist. Curtis simply watered them enough to keep the medium moist. The cuttings were left in the flats until their roots came through the bottom—usually in three to four months. Curtis recommends potting in 1 or 2 gallon containers (depending on the plant's root system). Cuttings should be handled carefully to avoid root injury.

The key to Curtis' method is the use of cuttings from 2 year old, field-grown plants. These juvenile cuttings are much more amenable to rooting than are cuttings from old trees. Ninety percent rooting is achieved this way.

Curtis noted that it is important to leave the terminal bud intact so that ensuing growth is straight. If the terminal bud is removed, the lateral bud that breaks tends to produce something of a dogleg.

Stadtherr's Experiments

Stadtherr, who is based in Louisiana (19), conducted a number of studies that resulted in high degrees of success. In mid-June and mid-July, terminal cuttings (to the fifth node) and leaf bud cuttings (to the sixth, seventh, eighth, and ninth nodes) were collected from 10 to 12 foot trees from rows at a North Carolina nursery. Only terminal cuttings were taken in mid-August and September.

All cuttings were given a two-sided 1 to 1½ inch long, heavy wound. The bottom leaf was removed. Control cuttings were soaked in distilled water for 80 seconds. Others were dipped for 10, 20, 40, or 80 seconds in a 50-percent alcohol solution containing IBA at 5,000 ppm.

The rooting medium was German peat mixed with coarse perlite. Cuttings were given 75° to 80° bottom heat and placed in a greenhouse. Greenhouse temperatures were maintained at 75° during the day and approximately 60° at night. Forty percent shade was provided. Intermittent mist averaged 2 seconds per minute the first week and 1.3 seconds per minute for the remainder of the rooting period.

Practically none of the June terminal cuttings rooted; they were too soft. And all the leaf-bud cuttings were unsatisfactory.

After 13 weeks, July cuttings that had been given 0, 10, 20, 40, or 80 second dips in the IBA solution rooted at 15, 90, 100, 100, and 85 percent, respectively, and took 12 weeks. September cuttings treated with IBA averaged rooting rates of 20 percent; none of the control cuttings taken that month rooted.

Stadtherr repeated his work a year later but used on 10 and 20 second dips in IBA solution and control dips in distilled water. July cuttings given these treatments rooted at 78, 93, and 10 percent, respectively. August cuttings rooted at 85, 80, and 3 percent. Additional studies done in 1967 with cuttings taken from plants rooted three years earlier produced similar results.

Brailsford's Findings

Brailsford, working in Orangeburg, South Carolina (2), used the

following procedure to root a number of *M. grandiflora* clones. (Unfortunately, he failed to provide rooting percentages.)

Four to 6 inch long cuttings were taken in late June and early July. Cuts were made at 45 degree angle at the base. Cuttings were given dips in fungicide and in Rootone F and inserted 2 inches deep into moistened and tamped vermiculite. Cuttings were kept in open-frame mist houses, and they received two seconds of mist every three and one-third minutes from 8 AM until dark. As cuttings rooted, the mist was cut back.

Cuttings were sprayed with fungicide at two-week intervals. They started to root in six to eight weeks and were sprayed with a soluble fertilizer. Rooted cuttings were transplanted into 1 to 3 quart pots. Cuttings propagated by this method must be handled with extreme care since roots in vermiculite are particularly fragile.

Cedar Lane Farm, Madison, Georgia, roots cuttings in July using firm wood. Cuttings are taken with two to three leaves. The leaves are cropped, and cuttings are given a wound on one side. They are treated with IBA at 1,000, 3000, or 8,000 ppm in talc, and stuck in coarse perlite (with Osmocote and Micromax incorporated) in deep flats. The cuttings receive intermittent mist. They are set on benches in full sun in a propagation house with its top open and sides closed.

Rooting success averages 50 percent. The process takes about two months, after which cuttings are transplanted to 1 gallon containers, protected under shade and overwintered under white plastic and shade cloth. The next year, the plants are grown-on in 1 gallon containers, overwintered and shifted to 3 gallon pots in the spring. They are then grown on to produce a heavy 3 gallon plant by the third or fourth year.

It should be mentioned that Cedar Lane Farm takes its cuttings from 8 to 10 year old, field-grown trees. Some are taken from 15 to 20 year old trees as well.

Georgia Studies

For the past three years at the U of G, we have stumbled, fallen and had miserable fortune attempting to root cuttings of *M. grandiflora* 'Bracken's Brown Beauty' and selected campus trees. Some growers have had reasonable success with 'Bracken's Brown Beauty' but have achieved nothing consistently approaching the 90 to 100 percent success rate reported for other cultivars (3,4). Considerable differences in ease of rootability exist among cultivars (17).

We tried all kinds of propagation permutations and combinations with limited success during the three-year period. Water management has been a real problem, and this has finally been solved by the use of intermittent mist (two and a half seconds every five minutes from 8 AM until dark).

Sand or peat-perlite media stayed too wet, and coarse perlite was substituted. None of the IBA concentrations we tried in 50 percent alcohol solutions gave good results.

In August 1984, a rooting study was conducted using IBA, napthaleneacetic acid, Wood's Rooting Compound and Dip'N Grow. Rooting was dismal throughout, largely due to water management problems. The only cuttings that rooted at all were those treated with NAA or Dip'N Grow (which contains NAA).

This summer, in comparative studies, 1 percent NAA produced 100 percent rooting, compared to 27 percent rooting with 1 percent IBA. Cuttings were collected in South Carolina on July 3, and they rooted nine weeks later. The NAA cuttings averaged 10.7 roots per cutting.

These were the other ingredients of our success:

—4 to 6 inch, semihardwood cuttings were taken from 8 to 10 foot, nursery-grown trees.

—Terminal buds were removed.

—A 1 inch deep, one-sided wound was made.

—Two terminal leaves remained intact.

—Cuttings received a five second dip in a solution of 1 percent NAA in 50 percent alcohol.

We are now backtracking to make sure the initial results are not an anomaly. Studies of cuttings with terminal buds removed and retained and of cuttings treated to different concentrations of NAA are underway. These studies should contribute more pieces to the jigsaw puzzle of *Magnolia grandiflora.*

Rooting Tips

Obviously, there is more than one way to root cuttings of *M. grandiflora.* The following points should be considered:

—Young stock plants (in juvenile condition) should be used.

—Good sanitation should be practiced.

—A hormone is necessary and may be applied as either a concentrated dip or a soak. Hormodin No. 3 or Rootone F may be used.

—IBA is the preferred rooting hormone based on most published research—but NAA may be worth testing.

—Wounding is beneficial.

—Cuttings should be in a semihardwood condition and not actively growing.

—When rooting commences, mist application should be reduced and the hardening (weaning) process should be started.

—Rooted cuttings transplant readily, but care must be exercised not to damage fleshy (and often sparse) roots.

—In the southeastern United States, July and August are probably the best months to take cuttings.

—Bottom heat is beneficial but is not used by all propagators.

—The rooting medium should be well-drained, and flats or beds should be deep (4 inches or more).

—Intermittent mist at the rate of approximately two seconds every five to six minutes appears essential in most cases.

—Four to six inch long cuttings with two to five terminal leaves are ideal.

—Reducing the leaf surface area (by cutting) is not necessary.

—Shading cuttings during rooting might be beneficial, although two schools of thought exist concerning this point.

Propagation for Select Specimens

If a superior specimen of *M. grandiflora* is located, how can nurserymen secure the first plants?

Grafting or budding is one approach. Cuttings can be tried, but they should always be collected from the lower part of the plant (a more juvenile area than the upper part).

For a precious few plants, a modified form of air layering that involves girdling, hormone preparations and etiolation (9) may be considered. Hare's method involves removing a 1 inch layer of bark about 10 inches below the

terminal bud in June. The area is treated with hormone slurry and the girdle is covered with a moist Kys-Kube (a peat cube). Moist sphagnum should also suffice. The medium is sealed against the stem with 4 inch wide Parafilm, which is similar to Saran Wrap, but heavier. The area is then covered with aluminum foil.

When roots emerge under the Parafilm, the cutting is severed from the tree and planted in a container or outside bed. Even if roots have not formed, the treated stems should be removed after six weeks and stuck in a mist bench. The cuttings will often root since they have already been primed and there is an accumulation of sugars and hormones at the girdled area.

Hare and others have had excellent success using this method with difficult to root species. These plants can then be used as a source of cutting wood for increasing numbers of the selected clone.

Nurserymen have discussed the merits of grafted trees versus those grown on their own roots and generally agree that both production methods work well. The grafted tree may grow faster initially, but the ultimate long-term performance of both types of trees is similar.

We have observed many trees that have been propagated from cuttings and found them vigorous, stable and readily transplantable.

We are also looking at tissue culture for the production of *M. grandiflora*. To date, explants have been established in culture, but no shoot multiplication has occurred. It will take considerable media manipulation before success is achieved. But successful propagation of *M. grandiflora* by cuttings did not occur overnight, either. Even today, this method is not cookbook simple.

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