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Propagation of *Magnolia virginiana* 'Santa Rosa' by Semi-Hardwood Cuttings[1]

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Abstract

Terminal, semi-hardwood cuttings (tips of first-order laterals) of *Magnolia virginiana* L. 'Santa Rosa' ('Santa Rosa' sweetbay) were collected on November 13, 1997, and treated with 0, 6, 12 or 25 mM (0.0, 0.13, 0.25 or 0.5%) indolebutyric acid (IBA) in factorial combination with equivalent mM concentrations of naphthaleneacetic acid (NAA) (0.0, 0.11, 0.23 or 0.46%). Rooting was maximized (83%) for cuttings treated with 25 mM (0.5%) IBA alone. Percent rooting for treatments of NAA alone or in combination with IBA never exceeded that of IBA alone at 12 or 25 mM (0.25% or 0.5%). Root number and root length were unaffected by any treatment with means of 2.4 roots and 10 cm (4 in), respectively.

Index words: adventitious rooting, auxin, indolebutyric acid, naphthaleneacetic acid, native plants, sweetbay.

Significance to the Nursery Industry

'Santa Rosa' sweetbay is an evergreen form of the native sweetbay (*Magnolia virginiana* L.). This selection, which is usually single stemmed, has an upright habit with an open canopy. Nurserymen have indicated that stem cuttings of 'Santa Rosa' are difficult to root in high percentages. However, results herein indicate that semi-hardwood cuttings can be rooted in high percentages (>80%) when treated with 12 or 25 mM (0.25% or 0.5%) indolebutyric acid (IBA) in 50% isopropanol.

Introduction

Magnolia virginiana L. 'Santa Rosa', a 1979 introduction by Woodlanders Nursery, Aiken, SC, has evergreen leaves and lemon-scented flowers both of which are larger than the species. Young plants can produce height growth ranging from 1 to 1.5 m (3 to 4 ft) per year. Although plants are in demand, production of 'Santa Rosa' sweetbay has been hindered by propagation difficulties associated with rooting stem cuttings. Attempts to root cuttings have either failed completely or have been marginally successful.

Propagation of the native sweetbay can be accomplished by both sexual and asexual means (1). For optimum rooting of sweetbay and the related southern magnolia (*Magnolia grandiflora* L.), semi-hardwood cuttings are usually taken when a terminal bud has formed and the wood has begun to harden (mature) (1, 3). Talc formulations of 0.3% or 0.8% IBA reportedly stimulate rooting (1, 6). In addition, solutions of naphthaleneacetic acid (NAA), alone or in combination with IBA have also improved adventitious rooting (2, 3). Therefore, the objective of this study was to determine the optimum auxin form and concentration for rooting semi-hardwood stem cuttings of 'Santa Rosa' sweetbay.

Materials and Methods

Terminal, semi-hardwood cuttings (tips of first-order laterals) of 'Santa Rosa' sweetbay 25 cm (10 in) in length, were collected from containerized stock plants at Tarheel Native Trees, Clayton, NC, on November 13, 1997. As cuttings were collected, they were wrapped in moist newspaper and placed in polyethylene bags. Bags were transported on ice to the Horticultural Science Greenhouses, Raleigh. Stem tissue at this growth stage was rigid and fairly inflexible with well developed terminal buds. Stems snapped when bent to the point of breaking and a distinct, crisp sound was noted when stems were cut with pruning shears. This is in contrast to stem tissue in an active state of growth, which is very flexible, soft, and easily damaged.

From the initial cutting material, 10 to 15 cm (4 to 6 in) long terminal cuttings were prepared. Leaves were removed from the lower half of the cuttings and the remaining leaves were cut in half, perpendicular to the midrib. All visible flower buds were removed at this time and throughout the rooting period when they were observed. The basal 1 cm (0.4 in) of the cuttings was then treated for 1 sec with 0, 6, 12 or 25 mM (0.0, 0.13, 0.25 or 0.5%) IBA in factorial combination with equivalent mM concentrations of NAA (0.0, 0.11, 0.23 or 0.46%) in 50% isopropanol.

Following auxin treatment, cuttings were allowed to air dry for 15 min before inserting the basal 5 cm (2 in) into a raised greenhouse bench containing a medium of perlite:peat (2:1, by vol) maintained at 24 ± 2C (75 ± 4F) with bottom heat. Intermittent mist operated daily for 5 sec every 6 min during daylight hours. Cuttings were maintained under natural photoperiod and irradiance with days/nights of 24 ± 5C (75 ± 9F)/18 ± 5C (65 ± 9F). As a preventive measure, Daconil (chlorothalonil), a broad-spectrum fungicide, was applied weekly, as a spray application to runoff, at a concentration of 4 ml/liter (1.0 tbsp/gal).

The experimental design was a randomized complete block with a factorial arrangement of treatments consisting of four IBA concentrations × four NAA concentrations × six cuttings per treatment × five replications. After 14 weeks, cuttings were harvested and data recorded. Data included percent rooting, number of primary roots ≥1 mm (0.04 in) in

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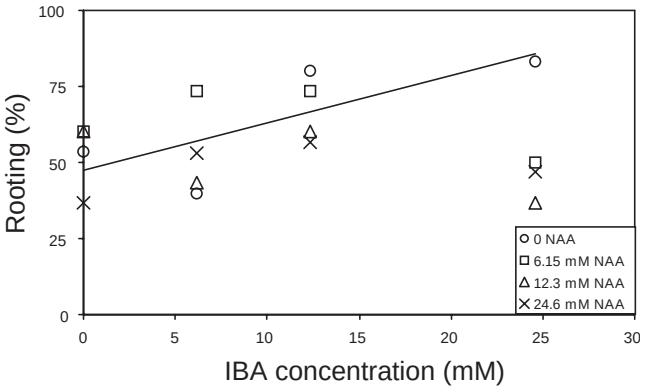

Fig.1. Influence of IBA and/or NAA treatment on rooting semi-hardwood cuttings of 'Santa Rosa' magnolia. Symbols represent means, n = 5. Regression line represents predicted response with NAA = 0 (y = 1.56x + 47.4); r^2 = 0.61.

length, and individual root lengths. All data except rooting percentages were based on the actual number of cuttings that rooted (at least one primary root). Data were subjected to analysis of variance and regression analysis.

Results and Discussion

Analysis of percent rooting revealed an interaction between IBA and NAA. When the auxin solution did not contain NAA, percent rooting increased linearly with increasing IBA concentration to a maximum of 83% following treatment with 25 mM (0.5%) (Fig. 1). Including NAA in the treatment solution never stimulated rooting greater than that of 12 or 25 mM (0.25% or 0.5%) IBA alone. In fact, increasing concentrations of NAA usually resulted in decreased rooting.

Our results are in contrast to reports of other investigators. In previous work with sweetbay, IBA and NAA used alone promoted adventitious rooting only slightly (2) when cuttings were collected 'July 31'. However, when the two auxins were combined as a single treatment, rooting was 65% compared to 18% in nontreated controls. In addition, other reports on propagating cultivars of southern magnolia by stem cuttings indicate that in comparison to IBA, NAA may be either a superior root promoting compound (3) or have no affect on rooting (5).

Stem cuttings of 'Santa Rosa' sweetbay produced abundant callus at the stem base whether or not rooting occurred. Roots emerged typically from a cutting at the lowest point of living tissue, usually at the cut surface of the cutting base. However, if necrotic tissue existed at the cutting base, roots emerged from the living tissue immediately above the necrotic area. Roots rarely emerged through the cortical stem tissue, and were thick and brittle, strongly suggesting that rooted cuttings must be handled with care during transplant. Cuttings usually resumed active terminal growth before rooting was complete, and once potted in an appropriate growing medium, vigorous shoot growth was observed the following growing season.

Root number and root length were unaffected by auxin treatments. Averaged over all auxin treatments, mean root number and mean root length were 2.4 roots and 10 cm (4 in), respectively.

Semi-hardwood cuttings of broad-leaved evergreen species are normally collected from mid-summer to early fall after a flush of growth has occurred and the wood has begun to mature (4). In North Carolina, cuttings collected as late as November 13 are considered generally to be past the semi-hardwood stage and approaching the hardwood growth stage. 'Santa Rosa' sweetbay, however, perhaps due to a Florida provenance, continued terminal shoot growth through October. Stem tissue and terminal buds were not sufficiently mature to be considered semi-hardwood until November.

During 1997, the authors also attempted to root softwood and hardwood cuttings of 'Santa Rosa' using similar treatments. Softwood cuttings, prepared from vigorously growing, succulent shoots, rooted poorly due to high mortality. On the other hand survival of hardwood cuttings was much improved. However, rooting of hardwood cuttings was generally poor (<30%), although we suspect that results can be improved. Due to a shortage of cutting material, hardwood cuttings were collected from stock plants at three different localities each with varying climates and levels of fertility. Cutting quality varied also between sources, as did rooting. High quality hardwood cuttings appeared to root fairly well and potentially may be capable of rooting similar to semi-hardwood cuttings.

Results demonstrate that semi-hardwood cuttings of 'Santa Rosa' sweetbay can be rooted in high percentages. Rooting (>80%) occurred within 14 weeks when cuttings were treated with 12 or 25 mM (0.25% or 0.5%) IBA and subjected to bottom heat. Contrary to previous reports, in which NAA when combined with IBA stimulated rooting in some species of magnolia, NAA was of no benefit to cuttings of 'Santa Rosa'.

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