Plant Propagation Research at Greenleaf Nursery

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INTRODUCTION

Greenleaf Nursery has been propagating quality liners for 51 years. Currently at our Park Hill, Oklahoma location, we propagate about 900 taxa from cuttings, seed, division, or grafting. Cuttings constitute the largest source of new plant material with approximately 18 million on the 1998 propagation schedule. Due to the large numbers of cuttings we need to produce yearly, we are always conducting research in an effort to increase our rooting percentages.

EFFECT OF ALCOHOL VS. TALC WITH VARIOUS IBA RATES ON AUTUMN BLAZE® FREEMAN MAPLE

Greenleaf Nursery currently propagates cuttings from several *Acer* taxa that are commonly bought as tissue culture liners by other nurseries. These include *A. rubrum* 'Franksred', Red Sunset® red maple; *A.* ×*freemanii* 'Jeffersred', Autumn Blaze® Freeman maple, and *A. rubrum* Autumn Flame® red maple. In an attempt to determine optimum rooting compounds for *Acer* cuttings we compared the effect of four IBA rates prepared using 70% isopropyl alcohol or talc. Softwood *A.* ×*freemanii* 'Jeffersred', Autumn Blaze® Freeman maple cuttings were harvested on 17 July 1998 from trees growing in 26.5-liter (7-gal) containers. Cuttings were trimmed to 7 cm (2.8 inches) and bundled into groups of 25. The basal 2 cm (0.8 inch) of the cuttings were dipped into one of the following treatments: (1) alcohol control, (2) talc control, (3) 0.8% IBA in alcohol, (4) 0.8% IBA in talc (Hormex 8), (5) 1.6% IBA in alcohol, (6) 1.6% IBA in talc (Hormex 16), (7) 3.0% IBA in alcohol, and (8) 3.0% IBA in talc (Hormex 30). Cuttings receiving the alcohol treatments were given a 3-sec quick dip. Cuttings given the talc treatments were moistened with water prior to dipping, then gently tapped to remove excess powder. Cuttings were stuck in randomized blocks of 5 rows by 25 cuttings and repeated five times for a total of 625 cuttings per treatment. Cuttings were placed in sand and bark (1 : 1, v/v) medium under 63% shade and intermittent mist. Cuttings were misted for 6 sec each hour from 8:00 AM to 11:00 AM, then 6 sec every 12 min from 11:00 AM to 20:00 PM. On 25 Aug. 1998, rooted, live cuttings were counted (Table 1). Little or no difference was seen between the alcohol and talc used with 0.8 and 1.6% IBA concentrations. At 0 and 3% IBA, there was a difference in the effect of alcohol compared to talc. Alcohol with 0% IBA produced the lowest rooting percentage.

EFFECT OF AUXIN ON ROOTING OF 'BROADMOOR' JUNIPER

Based on auxin levels used in the past, a study was done to determine the optimum auxin level for rooting *Juniperus sabina* 'Broadmoor' cuttings. Since cuttings take many months to root without bottom heat, fungicide treatments were added to determine beneficial effects on controlling stem rot in the cuttings. On 20 Nov. 1997, 'Broadmoor' juniper cuttings were taken from 2-year-old plants in 3.8 liter (1 gal) containers, stripped of lower foliage, sorted into bundles of 25, then placed on a mist bench. Cuttings were given one of the following treatments: (1) 4.5% IBA talc + 1%

Cleary's 3336, (2) 3.0% IBA talc, (3) 3.0% IBA +3.0% NAA Talc + 1% Cleary's 3336, (4) 3.0% IBA + 1.6% NAA talc + 1% Cleary's 3336, (5) 2.5% IBA in alcohol, (6) 2.5% IBA in alcohol + 1% Cleary's 3336, (7) 2.5% IBA + 1.25 NAA in alcohol, (8) 1.9% IBA in alcohol, (9) 1.9% IBA liquid + 1% Cleary's 3336, or (10) control — without hormone fungicidal application. Treatments with talc applications had fungicide (1% Cleary's 3336), auxin, and talc mixed together.

Alcohol treatments were given an auxin dip and were then dipped into the dry fungicide (Cleary's 3336). The ten treatments were repeated four times with 2500 cuttings per treatment. Two randomized repetitions (50,000 cuttings) were placed in ground beds in one quonset and two randomized repetitions were place in another quonset. Cuttings were stuck in blocks of 50 rows with 50 cuttings per row. The medium was sand and bark (1 : 1, v/v). Phytotronic® mist clocks were set to allow misting at 4 sec every 15 min. Rooting percentages of the cuttings were estimated 15 July 1997.

It was concluded that 2.5% IBA in alcohol solution produced the highest mean rooting percentage and 1% Cleary's 3336 had no beneficial effect (Table 2). The 1% Cleary's 3336 appeared to have adversely affected rooting when used with the 1.9% alcohol treatment. There was no effect between the two locations of the repetitions.

INFLUENCE OF REMOVING THE TERMINAL PORTION OF CONIFER CUTTINGS

In the winter of 1996, an experiment was done to compare rooting of *J. chinensis* 'Hetzii Columnaris' and *J. procumbens* 'Green Mound' using different types of cuttings. Three-fourths of each cultivar had terminals cut out of the cuttings, while one-fourth had the terminal end left intact. The 'Hetzii Columnaris' cuttings without terminals were approximately 8 cm (3.2 inches) and cuttings with their terminals intact were approximately 18 cm (7.1 inches). The 'Green Mound' cuttings were 6 cm (2.4 inches) and 10 cm (3.9 inches), respectively. It was concluded that cuttings with their terminal ends intact rooted in higher percentages and in less time than ones with terminal removed.

In 1997, the experiment was repeated except that most of the plants had their terminals left intact and a smaller percentage had their terminals removed. The following cultivars were tested: *J. chinensis* 'Armstrong Aurea', *J.* ×*pfitzeriana* 'Armstrong' (syn. *J. chinensis* 'Armstrong'), *J.* ×*pfitzeriana* 'Old Gold', J. virginiana 'Hetz' [syn. *J. glauca* 'Hetzi' (understock)], *J. scopulorum* 'Skyrocket', *J. procumbens* 'Green Mound', *J. chinensis* 'Hetzii Columnaris', *J. procumbens*, *J. procumbens* 'Nana', and *J. procumbens* 'Variegata'. Results showed that leaving the terminal portion of the cuttings intact did not affect rooting in 'Old Gold', 'Armstrong', 'Hetz' understock, or 'Skyrocket' junipers. Leaving the terminal portion of the cutting intact enhanced rooting in 'Hetzi Columnaris', 'Green Mound', *J. procumbens*, 'Variegata' and 'Nana'. Since 'Skyrocket' did not get sheared, leaving the terminal provided a much larger, transplantable liner. There were no instances where uncut tops reduced rooting percentages. Cuttings with tops intact needed less mist and had less dieback and disease incidence.

WHITE PLASTIC BAFFLES VS. CLEAR PLASTIC BAFFLES ON WESTERN EXPOSURES

Plastic baffles 1.2 m (4 ft) high are used to reduce the wind's effect on mist patterns in our quonset propagation houses. During the hottest periods of summer, clear plastic baffles act like magnifying glasses, desiccating newly rooted cuttings along

west edges of the houses. In 1996, we conducted a comparison using 10 houses with white baffles on west sides and clear baffles on the east and compared them to houses with clear baffles on both sides. Results showed a 2.8 to 8.3C (5 to 15F) cooler propagation medium temperature on west sides with white plastic (compared to clear plastic baffles), depending on temperature, time of day, and angle of the house to the sun. The amount of leaf burn and plant loss on sides with white plastic was negligible, while west sides with clear plastic had losses up to 30% in rows within 18 cm (7.1 inches) of the clear plastic. Due to white plastic providing shade in late afternoon, cuttings in houses with white baffles on the west looked better overall. In 1997, white baffles were used on west sides of quonsets containing heat-sensitive taxa. It is now practice at Greenleaf Nursery to use white plastic baffles on west sides of all quonsets from June through August.

TRAY MEDIUM TRIALS

At Greenleaf Nursery we use approximately 90,000 TLC polyform trays each year. It is quite challenging finding a medium that is cost effective, yet allows optimum propagation of hundreds of plant taxa. This study compared the effect on rooting and survivability of five different tray media while considering the cost. The experiment was done on 12 taxa, but due to space limitations the results of only nine are listed in Table 4. Cuttings were stuck from 15 July to 31 July 1997, depending on plant with two liners per cell in a 24-cell tray. Cuttings were evaluated after they were removed from mist and acclimated. Cuttings that rooted and were still alive were evaluated on 16 Aug. 1997. Cuttings were again evaluated on 22 Oct. 1997 to determine any further medium influence on survivability. The media compared are shown in Table 3. Readings were taken on macronutrients and pH weekly. Results varied among taxa, but Medium 1 and Medium 2 consistently produced the highest percentage of rooted cuttings across the 12 taxa tested (Table 4). Medium affected cuttings survivability, but the response was plant specific. It was concluded that due to price differences between media, Medium 1 [perlite and peat (1 : 1, v/v)] would be used as a primary tray medium with hard-to-root taxa. Medium 5 [perlite, fine pine bark, and peat (1 : 5 : 1, by volume)] proved most cost effective and satisfactory for propagating easy-to-root taxa, such as 'Lynwood Gold' forsythia, crapemyrtles, and golden barberry — where propagation medium didn't significantly influence rooting percentage or survivability.

Table 1. Response of *Acer* ×*freemanii* 'Jeffersred', Autumn Blaze® Freeman maple cuttings to selected IBA concentrations and solvents.

IBA concentration	Auxin carrier	Rooted cuttings (no.)	Rooting (%)
0	Alcohol	291	46
	Talc	371	76
0.8%	Alcohol	529	85
	Talc	555	88
1.6%	Alcohol	556	89
	Talc	557	89
3.0%	Alcohol	535	86
	Talc	463	74

Table 2. Effect of auxin and fungicidal treatment on *Juniperus sabina* 'Broadmoor'.

Auxin carrier	IBA (%)	NAA (%)	Fungicide application	Rooting (%)
Talc	4.5	0	yes	70.0
	3.0	0	yes	80.5
	3.0	3.0	yes	62.5
	3.0	1.6	yes	76.0
Alcohol	2.5	0	no	83.0
	2.5	0	yes	81.5
	2.5	1.3	yes	78.5
	1.9	0	no	79.5
	1.9	0	yes	69.5
Water control	0	0	no	77.5

Table 3. List of five propagation media utilized and their cost per cubic yard.

Medium	Components	Cost per yard
Medium 1	Perlite and peat moss (1 : 1, v/v)	$42.50
Medium 2	Perlite, pine bark, and peat moss (3 : 2 : 1, by volume)	$29.10
Medium 3	Perlite, fine pine bark, and peat moss (2 : 4 : 1, by volume)	$22.11
Medium 4	Perlite, fine pine bark, and vermiculite (4 : 32 : 1, by volume)	$17.19
Medium 5	Perlite, fine pine bark, and peat moss (1 : 5 : 1, by volume)	$17.85

Table 4. Effect of five propagation media on rooting and survivability on *Berberis japonica* 'Nana', *B. thunbergii* 'Aurea', *Myrica pensylvanica*; *Spiraea japonica* 'Little Princess', *Cornus sericea* 'Isanti', *Hibiscus syriacus* 'Minerva', *Lagerstroemia* 'Tonto', *Forsythia* ×*intermedia* 'Lynwood', and *Cotoneaster adpressus* 'Little Gem' (syn. 'Tom Thumb').

Taxa	Propagation medium (no.)	Cuttings stuck (no.)	Root (%) 16 July	Root (%) 22 Oct.	Lost (%) 16 Jul. - 22 Oct.
Berberis japonica 'Nana'	1	1440	84.0	63.9	20.1
	2	1680	81.0	60.2	20.8
	3	1680	74.6	63.7	10.9
	4	1680	55.8	43.5	12.3
	5	1680	76.2	66.4	9.8
B. thumbergii 'Aurea'	1	1680	98.8	97.3	1.5
	2	1680	92.7	89.8	2.9
	3	1680	93.0	92.7	0.3
	4	1680	90.6	89.9	0.7
	5	1680	94.5	93.3	1.2
Cornus sericea 'Isanti'	1	1680	97.3	85.7	11.6
	2	1680	90.6	83.8	6.8
	3	1680	92.7	88.9	3.8
	4	1680	96.6	95.0	1.6
	5	1980	83.6	72.9	10.7
Cotoneaster adpressus 'Tom Thumb'	1	1680	80.8	62.6	18.2
	2	1680	80.2	47.6	32.6
	3	1680	65.3	46.7	18.6
	4	1680	35.7	14.5	21.2
	5	1680	52.5	49.0	3.5

Forsythia × *intermedia* 'Lynwood Gold'	1	1248	99.8	99.8	0.0
	2	1248	98.8	96.6	2.2
	3	1248	98.3	98.3	0.0
	4	1248	97.9	97.9	0.0
	5	1248	96.1	96.1	0.0
Hibiscus syriacus 'Minerva'	1	840	97.0	92.9	4.1
	2	840	88.0	81.4	6.6
	3	840	91.0	51.5	39.5
	4	840	90.0	67.0	23.0
	5	840	84.0	50.2	33.8
Lagerstroemia 'Tonto'	1	1680	99.8	99.7	0.1
	2	1680	97.4	96.0	1.4
	3	1680	98.3	98.0	0.3
	4	1680	90.6	89.4	1.2
	5	1680	93.1	92.7	0.4
Myrica pensylvanica	1	1440	99.4	98.6	0.8
	2	1680	98.2	96.4	1.8
	3	1680	98.0	86.4	11.6
	4	1680	91.7	86.4	5.3
	5	1680	91.4	86.3	5.1
Spiraea japonica 'Little Princess'	1	1680	99.0	98.2	0.8
	2	1680	99.0	92.8	6.2
	3	1680	99.5	98.9	0.6
	4	1680	98.6	95.6	3.0
	5	1680	94.0	80.7	13.3