Stem Cutting Propagation of Bottlebrush Buckeye

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Stem cuttings of bottlebrush buckeye (*Aesculus parviflora*) were taken monthly after vegetative bud break from May through July. Cuttings taken in May rooted at significantly higher percentages than those taken in July. In another study, cuttings were treated with 0, 2500, 5000, and 10,000 ppm IBA in solvents of water, propylene glycol, or ethanol. Cuttings treated with ethanol had the greatest number of roots per rooted cutting and the highest rooting percentage. The best treatment producing the highest rooting percentage was 2500 ppm IBA in ethanol.

INTRODUCTION

Bottlebrush buckeye (*Aesculus parviflora*) is a large, native shrub that grows up to 3.7 m (12 ft) wide and 4.6 m (15 ft) tall and is hardy in much of the eastern United States. Panicles of white flowers with prominent stamens are borne in profusion above the foliage in mid summer. Two distinct types exist. *Aesculus parviflora* flowers in late spring while *A. parviflora* f. *serotina* flowers about 3 weeks later. The fact that bottlebrush buckeye performs well in both the full sun and dense shade makes it a valuable landscape plant (Dirr, 1977). However, bottlebrush buckeye is frequently in limited supply within the nursery industry.

One reason the supply of plants is limited is that most are propagated from seed. Seed propagation requires viable seeds which are collected before they can dry out and planted shortly after collection since seed loses viability quickly and no dormancy requirements exist (Fordham, 1987). Root cuttings are frequently mentioned as the preferred method of propagation (Macdonald, 1986), but successful propagating percentage is often low.

Research (Dirr and Burd, 1977) indicated that rooting of softwood cuttings has great potential. In 1976, 80% rooting was obtained using 1000 ppm IBA in an alcohol quick dip but in 1977, this same treatment produced no rooting, while a 5000 ppm IBA quick dip produced 60% rooting. These differences were attributed to the rapid maturation of cutting wood in bottlebrush buckeye. It was suggested that since the 1977 cuttings were taken from more mature tissue, they required treatment with a higher concentration of IBA in order to root. However, they also reported that concentrations of 10,000 ppm IBA and higher appeared to be toxic.

Follow-up research (Bir et al., 1994) to help determine guidelines for commercial propagators concerning timing of cuttings and auxin rates were undertaken. A timing study was conducted at Lorax Farms, Warrington, Pennsylvania, while an

auxin concentration study was conducted at the Mountain Horticultural Crops Research Station (MHCREC), Fletcher, North Carolina. Results indicated that seasonal timing is very important and that rooting was best within the first 6 weeks after vegetative bud break in spring. In addition it was reported that auxins were not essential for rooting, but significantly enhanced rooting percentage.

The timing study was conducted using IBA plus NAA in propylene glycol but questions remained concerning the efficacy of commonly used solvents. Therefore in 1994, studies were undertaken at MHCREC to determine: 1) whether water, alcohol, or propylene glycol was the best solvent; 2) whether IBA alone could provide acceptable results; and 3) to further evaluate the influence of seasonal timing on the rooting of bottlebrush buckeye.

MATERIALS AND METHODS

Seasonal Timing Study. Cuttings were taken 1, 2, or 3 months after vegetative growth began in the spring. Terminal stem cuttings of 20 cm (8 inches) length were taken in the early morning from mature plants at the Biltmore House and Gardens, Asheville, North Carolina, and placed in a cooler with ice which was kept in the shade during transportation. At the MHCREC, flower buds were removed, cuttings were re-cut to 15 cm (6 inches), and leaf size reduced by approximately one-third. Prepared cuttings were quick-dipped for 1 sec into rooting solutions consisting of 95% ethanol with 0, 2500, 5000 or 10,000 ppm IBA. Cuttings were stuck in a 1 peat : 1 perlite (v/v) rooting media under intermittent mist.

Percentage rooting and number of roots per cutting were determined 1 month after sticking. There were five cuttings in each of three replicates (n=15). Treatments were randomized within replicates.

Solvent Study: Cuttings were taken in May and prepared as previously described. Control (0 IBA) cuttings were quick dipped for 1 sec in either water, 95% ethanol, or propylene glycol. For ethanol treatments, IBA was dissolved in ethanol and serial dilutions made with ethanol. For propylene glycol treatments, IBA was dissolved with propylene glycol and serial dilutions were made with water. K-IBA was dissolved and serially diluted with water for the water solvent treatments. Concentrations of IBA and K-IBA were: 0, 2500, 5000 or 10,000 ppm. Percentage rooting and number of roots per cutting were determined 1 month after sticking cuttings.

RESULTS

Seasonal Timing Study. Rooting percentage declined with time. The highest percentage occurred in cuttings stuck a month after vegetative growth began (May). Cuttings stuck in May rooted in significantly higher percentages than those stuck in July but not significantly better than those stuck in June. (Table 1). All concentrations of IBA enhanced rooting in May, while only 10,000 ppm enhanced rooting in June, compared with the control (Table 2). With July stuck cuttings, IBA did not enhance rooting. The number of roots per cutting rooted (data not shown) did not exactly follow rooting percentage. In May and June all IBA treatments increased the number of roots per rooted cutting, with 5000 and 10,000 ppm IBA having the greatest effect (data not presented). Few roots developed with July stuck cuttings, and root number was not influenced by IBA treatments.

Table 1. Rooting percentage of bottlebrush buckeye stem cuttings stuck monthly after vegetative bud break from May through July.

Month cutting stuck	Rooting (%)[1]
May	73.3 a
June	60.0 ab
July	26.7 b

[1] Duncan's New Multiple Range Test, P=0.05.

Table 2. Effect of IBA dissolved in ethyl alcohol on rooting percentage of bottlebrush buckeye stem cuttings after vegetative bud break from May through July.

	Month stuck		
IBA (ppm)	May	June	July
0	73	60	27
2500	93	53	60
5000	100	60	60
10000	93	93	40

Table 3. Effect of three solvents used for auxin carriers on rooting percentage and root number of bottlebrush buckeye stem cuttings. All auxin treatments were pooled per solvent.

Solvent	Rooting (%)[1]	# Roots/rooted cutting
Water	62 b	5.3 b
Propylene glycol	68 b	8.1 a
Ethanol	88 a	9.3 a

[1] Duncan's New Multiple Range Test, P=0.05.

Solvent Study. The highest rooting percentage occurred when ethanol was used as a solvent (Table 3). The number of roots per cutting rooted was significantly greater when either propylene glycol or alcohol were used as solvents. The highest percentage rooting was achieved with 2500, 5000, and 10,000 ppm IBA in alcohol, 5000 and 10,000 ppm IBA in propylene glycol, or 10,000 ppm K-IBA in water. There were no significant differences in the number of roots per cutting rooted due to IBA treatments (data not shown).

Table 4. Effect of solvents and auxin concentration on rooting percentage of bottlebrush buckeye stem cuttings. IBA was mixed with the solvents propylene glycol and alcohol, while K-IBA was mixed with water.

Solvent	Auxin (ppm)	Rooting[1] (%)
Water	0	33 d
	2500	67 b
	5000	60 b
	10,000	87 a
Propylene glycol	0	40 cd
	2500	53 bc
	5000	87 a
	10,000	93 a
Alcohol	0	67 b
	2500	87 a
	5000	100 a
	10,000	100 a

[1] Duncan's New Multiple Range Test, P=0.05.

DISCUSSION

This research demonstrates that: 1) rooting percentage was greatest when cuttings were taken within 2 months after vegetative bud break in the spring; 2) ethanol was the most effective solvent for rooting percentage and both ethanol and propylene glycol treated cuttings had the greatest number of roots, and 3) when considering optimum rooting percentage and number of roots per cutting, 2500 ppm IBA in ethanol applied to May cuttings gave the best results, i.e., the lowest IBA concentration with the better solvent for maximum rooting.

LITERATURE CITED

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