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Propagation of a Hawthorn Lace Bug-Resistant Cotoneaster (*Cotoneaster buxifolius*) by Stem Cuttings[1]

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Abstract

Semi-hardwood cuttings of *Cotoneaster buxifolius* Wallich ex Lindl. were treated with indolebutyric acid (IBA) at rates of 0, 2000, 4000, 6000, or 8000 ppm, and rooted in flats containing either peat:perlite (1:1 by vol) or 100% perlite. Rooting percentage, numbers of roots, and root quality were generally higher in the 100% perlite medium. The greatest numbers of roots and highest root quality were obtained with the 4000 or 6000 ppm IBA.

Index words: rooting media, rooting hormone, insect resistance

Significance to the Nursery Industry

The production of insect resistant plant material can provide an environmental emphasis for marketing strategies. A cost effective propagation procedure has been developed for the production of *Cotoneaster buxifolius*, a species resistant to hawthorn lace bug. *Cotoneaster buxifolius* can be optimally propagated under intermittent mist using a 100% horticultural perlite rooting medium. A 5 sec dip in 4000–6000 ppm IBA consistently produced the greatest number of roots, with a high percentage of the cuttings successfully rooted.

Introduction

The hawthorn lace bug, *Corythucha cydoniae* (Fitch), selectively attacks numerous plants in the family Rosaceae, and is the primary insect pest of *Cotoneaster* (13), a shrub commonly planted in urban areas. Insect feeding results in foliar injury from mechanical removal of chlorophyll. Injury appears on the new foliage in spring and, if not controlled, may result in total browning of the leaves by mid-summer. Differences in susceptibility to feeding injury caused by hawthorn lace bug were evaluated among species and cultivars of rosaceous hosts (8, 9, 10). Two species of *Cotoneaster, C. lacteus* W. W. Sm. and *C. buxifolius* Wallich ex Lindl., were identified as possessing a high level of insect resistance to hawthorn lace bug.

Cotoneaster buxifolius is spreading, evergreen, much-branched, and grows to about 3 feet high. Leaves are oval to obovate, 5–10 mm (0.25–0.5 in) long, pubescent above when young and wooly beneath (1). The young stems are covered with pale, downy hairs. The fruit is bright red, about 5 mm (0.25 in) in diameter, and remains on the plant through late winter. The pubescence of the leaves and stems gives the plant an attractive blue-gray color that, combined with the long-lasting, bright red berries provides horticultural desirability. We feel this *Cotoneaster* is currently underutilized by the nursery industry. This may be due in part to its incorrect identification as *C. glaucophyllus* in California (6).

A key factor for introduction to the nursery industry is the grower's ability to successfully propagate this species. General recommendations for rooting cuttings of *Cotoneaster* spp. include use of a sand or peat:perlite medium and treatment with 1000–3000 ppm IBA (4). However, specific recommendations for rooting of *C. buxifolius* were not found. The objective of this study was to develop a propagation procedure that could optimize successful and cost effective production of this species by the nursery industry.

Materials and Methods

Semi-hardwood cuttings were taken from a single large *C. buxifolius* shrub on November 7, 1989, and November 9, 1990. Cuttings were also taken on July 26, 1990; however, serious losses occurred due to a mist system malfunction, and the summer rooting portion of the experiment was eliminated.

The cuttings were approximately 10 cm (4 in) in length. The basal 4 cm (1.5 in) were stripped of leaves, and dipped in solutions of 0, 2000, 4000, 6000, or 8000 ppm IBA in 50% ethanol for 5 sec. The cuttings were allowed to dry for 10–15 min before inserting them into the rooting medium. The rooting medium was either peat:perlite (1:1 by vol) or 100% horticultural perlite contained in plastic flats 53 cm (21 in) × 27.5 cm (10.75 in) × 6 cm (2.5 in) deep. There were 5 flats of each medium, and 80 cuttings per flat

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(16 cuttings for each IBA treatment per flat). The flats were placed under intermittent mist operated 5 sec every 5 min from 8 a.m. to 5:30 p.m. daily in a glass greenhouse with a minimum temperature of 13°C (55°F). The greenhouse was vented at 24°C (75°F). A split-plot experimental design was used, with medium as the main-plot factor and IBA level as the sub-plot factor. There were five replications, each replication consisting of two flats (one of each medium treatment). The IBA treatments were randomized within each flat. The cuttings were evaluated after 10 weeks for rooting percentage, number of roots, and visual quality. The data were subjected to analysis of variance procedures, with orthogonal contrasts used for trend analysis. Percent rooting data were subjected to arcsin transformation for statistical analysis. Data for the two years were analyzed separately.

Results and Discussion

Rooting responses for 1989 and 1990 were similar, with some exceptions. In the peat:perlite medium, more roots and slightly higher rooting percentages were obtained in 1989 than in 1990 (Table 1). The 100% perlite promoted significantly more roots and higher root quality ratings than peat:perlite for both years, but rooting percentages were significantly better than 100% perlite only in 1990. Differences in rooting between peat mixes and straight perlite have been reported with other plant material. Oka (7), Dirr (3), and Banko and Stefani (2), working with *Abelia grandiflora, Magnolia grandiflora*, and *Buxus* spp. respectively, obtained improved rooting with 100% perlite compared to peat:perlite media. With *Rhododendron arborescens* and *Arctostaphylos columbiana*, Lewis and Sizemore (5), and Ticknor and Bluhm (11) respectively, found a 100% perlite medium reduced rooting percentages. These contrasting results may reflect variations in plant material, and corresponding variations in response to the differences in water holding capacity and percent airspace inherent in the media; the peat media retaining more water with less air space than the 100% perlite. However, Tilt and Bilderback (12) were unable to attribute variations in rooting of 3 woody ornamental species to differences in air space or moisture content of rooting media in which these properties had been altered by manipulating particle size. This suggests that other factors such as water management may be interacting with variations in water holding capacity and percent air space. Those researchers that obtained good rooting response with 100% perlite provided mist regulated by a timer without regard to weather conditions (2, 3); in one case (7), mist was provided continuously. In contrast, researchers that obtained poor rooting with 100% perlite (5, 11) provided mist with systems that varied according to weather conditions. It may be that with a system that varies in misting frequency with changes in the weather, certain conditions could cause a very porous medium to become too dry for optimum rooting. However, a system that mists frequently without regard to weather may cause a medium with a high peat content to retain too much moisture for certain species. These factors may be involved in our study with *C. buxifolius*, where mist was provided regularly (5 sec every 5 min, daylight) and the rooting response for perlite was superior to peat:perlite. Differences in light intensity in the greenhouse may be involved with our differences in rooting in peat:perlite between 1989 and 1990.

The response to IBA concentration varied depending upon the medium. In the peat:perlite medium, rooting percentage was low with no IBA, but increased to 95% in 1989 and 84% in 1990 with 4000 ppm IBA. In 100% perlite, rooting percentages were high without IBA (85% and 98%); the IBA treatments improved rooting percentage very little. However, IBA did increase root numbers and quality in both media with more roots and higher quality ratings being obtained in the 100% perlite medium. The 2000 ppm IBA treatments improved root numbers and quality but, in the peat:perlite medium, these values remained constant as IBA rates increased. With the 100% perlite medium, increasing IBA concentrations up to 6000 ppm increased root numbers up to a mean of about 11 primary roots per cutting. The quality ratings also increased correspondingly.

The results of this study provide the optimal medium and IBA concentrations for commercial production of *C. bux-*

Table 1. Effect of medium and IBA concentration on rooting of cuttings of *Cotoneaster buxifolius*.

Medium	IBA (ppm)	Rooted Nov 1989 Rooting (%)	Rooted Nov 1989 Root no.	Rooted Nov 1989 Root quality[z]	Rooted Nov 1990 Rooting (%)	Rooted Nov 1990 Root no.	Rooted Nov 1990 Root quality
Peat/Perlite	0	44.0	1.2	1.5	42.6	1.0	1.5
	2000	92.8	6.2	2.7	77.6	2.2	2.0
	4000	95.2	5.7	2.4	83.8	2.8	2.2
	6000	75.0	5.6	2.4	81.4	2.5	2.0
	8000	85.0	6.7	2.6	76.2	2.3	2.0
Perlite	0	85.0	4.0	2.4	97.6	5.2	2.8
	2000	92.6	8.7	3.4	100.0	7.8	3.1
	4000	92.6	11.8	3.9	96.2	9.2	3.4
	6000	91.4	11.6	3.5	97.6	11.8	3.9
	8000	72.6	8.2	2.6	96.4	11.1	3.6
Significance[y]							
Medium (M)		NS	**	**	**	***	***
IBA (I)		***	***	***	NS	***	***
MxI_l		***	***	***	**	NS	**
MxI_Q		NS	**	***	***	***	***
MxI_C		*	NS	NS	NS	*	NS

[z]Root quality rating: 1 = no roots, 5 = profuse, well-distributed root system.

[y]NS, *, **, ***, indicates nonsignificant or significant at the 5%, 1%, or 0.1% levels, respectively.

ifolius, allowing for its increased marketing as an insect-resistant species for landscape use.

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Pre-forcing Treatments Influence Bud Break and Shoot Elongation in Forced Woody Species[1]

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Abstract

Experiments were conducted to evaluate the feasibility of pre-forcing treatments for the release of bud dormancy of dormant stems of lilac, privet and Vanhoutte spirea. The new softwood growth of these dormant stems was used either as explants for *in vitro* culture or as cuttings for rooting studies of woody plant species in the off-season. A pre-forcing 15% bleach solution (0.78% NaOCl) soak hastened bud break, enhanced percentage of bud break, and promoted shoot elongation. Pre-forcing wetting agent treatments produced similar results to those of the bleach soak with variation among wetting agents and plant species. Smaller treatment differences were observed in the forcing characteristics when stems were collected later in the winter, probably because the cold requirement of the buds had been completely or partially met. This technique will provide explants for *in vitro* culture and softwood cuttings for propagation of woody plants over an extended period.

Index words: pre-forcing, forcing solution, woody plants, dormancy, bud break, shoot elongation

Species used in this study: common lilac (*Syringa vulgaris* L.); privet (*Ligustrum vulgare* L.); Vanhoutte spirea (*Spiraea* × *Vanhouttei* (C. Briot) Zab.)

Significance to the Nursery Industry

Pre-forcing techniques described herein enable growers to produce new softwood growth from dormant stems of woody plant species in the off-season. This new growth can be used either as cuttings for rooting, or as explant materials for micropropagation. The technique also reduces the need for valuable greenhouse space to house stock plants, since stems to be forced can be collected in the fall and held in cold storage until needed for forcing.

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Introduction

Softwood shoots are the best explant source for woody plant tissue culture (8). However, the season to obtain such new softwood growth for *in vitro* culture and rooting propagules is relatively short. Furthermore field-collected materials used as explant sources frequently have a high contamination rate. Commercial bleach solutions and wetting agent(s) have been used for many years by tissue culturists for surface disinfestation. However, there are no reports in the literature of attempts to use pre-forcing bleach soaks before forcing the tissues of woody plant species.

In our research, pre-forcing soaks were employed to disinfest the dormant woody stems before putting them into the forcing solutions to provide cleaner softwood tissues for *in vitro* culture and the rooting of softwood cuttings. The