Rooting Stem Cuttings of Woody Ornamentals in a Cedar Amended Substrate

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Index Words: cutting propagation, eastern redcedar, *Thuja* 'Green Giant', *Ulmus parvifolia*

Significance to Industry: Stem cuttings of *Thuja* 'Green Giant' and *Ulmus parvifolia* 'Emerald Prairie' were rooted in a series of substrates containing increasing concentrations of eastern redcedar chips as well as a standard propagation substrate. As expected, cuttings of *Thuja* 'Green Giant' rooted well in the standard mix. Cuttings rooted as well in the 0% and 25% redcedar amended substrates (≥ 91% rooting) with decreasing rooting as redcedar content increased. Stem cuttings of *Ulmus parvifolia* 'Emerald Prairie' did not root as well as anticipated and rooting was negatively affected by the increasing redcedar content in the substrates. With both species, root number and root dry weight was not impacted by the increasing redcedar concentration. Results suggest redcedar may be an acceptable peat moss replacement for species that root relatively easily.

Nature of Work: Utilizing locally available materials for substrates during the nursery production process can enhance profitability and sustainability. Eastern redcedar (*Juniperus virginiana* L.), which grows throughout the eastern half of the United States may be one such material. Recent work has suggested that, when processed properly, eastern redcedar chips may be successfully incorporated into a container substrate for production of woody and herbaceous plants (4,5). However, as a propagation substrate, eastern redcedar has been virtually unexplored. Many propagation substrates use a blend of perlite and peatmoss to achieve proper water holding capacity and porosity (1). Peatmoss is a non-renewable resource and its increased usage has led to an increase in cost and concerns regarding its sustainability. This study seeks to expand the potential uses for eastern redcedar chips beyond a container substrate component into the propagation side of the nursery.

Chipped eastern redcedar trees from Queal Enterprises (Pratt, KS) were obtained and further ground with a hammer mill (Model 30HMBL; C.S. Bell Co., Tifton, OH) to pass a 3/16-in (4.76 mm) screen. The processed redcedar was then blended with perlite to form five substrates consisting of 0%, 25%, 50%, 75%, and 100% redcedar (by vol.). A standard 75% perlite:25% peat (by vol.) substrate was utilized for comparison. Substrates were then placed into 36-cell propagation trays with a cell volume of 7.5 oz (220 ml) and depth of 5 in (13 cm) (Stuewe and Sons Inc., Tangent, OR.).

On the morning of July 6, 2011, terminal stem cuttings of *Thuja* 'Green Giant' ('Green Giant' arborvitae) were collected from three different trees growing at the Kansas State University John C. Pair Horticultural Center (Haysville, KS). Cuttings were trimmed to a length of 6 in (15.2 cm) and the basal 0.5 in (1.3 cm) was dipped in 5000 ppm (0.5%) K-IBA (potassium salt of indolebutyric acid). The cuttings were allowed to air dry for 5 min and were then inserted into the substrates to a depth of 2.0 in (5.0 cm). Trays were then placed on a greenhouse bench under intermittent mist that operated for 6 sec every 6 min from 7:00AM to 8:00PM. On the morning of July 7, 2011 terminal cuttings of *Ulmus parvifolia* 'Emerald Prairie' ('Emerald Prairie' lacebark elm) were collected from stock plants growing at the John C. Pair Horticultural Center. The cuttings were processed identically to 'Green Giant' arborvitae with the exception that elm cuttings were treated with 10,000 ppm (1.0%) K-IBA. Cuttings were harvested after allowing 9 weeks for root development and evaluated for percent rooting, number of roots per rooted cutting, and root dry weight. A cutting was considered rooted if it had at least one root at least 0.04 in (1.0 mm) in length.

The experimental design was a randomized complete block design with six substrate treatments and six cuttings per treatment (subsamples). The treatments were replicated six times resulting in a total of 36 cuttings per treatment. Data were subjected to analysis of variance (ANOVA) and trend analysis. Where appropriate, means were separated with Fisher's protected LSD ($P \leq 0.05$). Each species was analyzed as a separate experiment.

Results and Discussion: Previous work has indicated that 'Green Giant' arborvitae is easy to propagate from stem cuttings (2), making it an ideal candidate for testing a new propagation substrate. As expected, stem cuttings of 'Green Giant' arborvitae rooted well in the standard perlite/peat substrate (92%). Cuttings rooted equally as well with 0% or 25% redcedar amended substrate, suggesting that redcedar could replace peatmoss for rooting stem cuttings of 'Green Giant' arborvitae. However, rooting was reduced when the redcedar content of the substrate was 50% or greater (Table 1). The number of roots was unaffected by redcedar content and averaged 12.7 roots per rooted cutting. Root dry weight was also unaffected by redcedar content and averaged 0.002 oz (55 mg) per rooted cutting.

'Emerald Prairie' lacebark elm has also been shown to root well as a semi-hardwood stem cutting (3). However, overall rooting in the current study was lower than expected, including using the standard perlite/peat substrate (67% rooting). The addition of redcedar into the rooting substrate decreased percent rooting in a linear fashion suggesting that redcedar negatively affected the rooting potential of the stem cuttings (Table 1). However, redcedar did not affect the average number of roots produced per rooted cutting (5.6). Root dry weight per rooted cutting was not influenced by the redcedar content of the rooting substrate and averaged 0.0007 oz (20 mg). However, in the standard perlite/peat substrate, root weight was improved to 0.002 oz (50 mg). The data herein suggests that processed redcedar may be an acceptable amendment to a propagation substrate for species that root easily from stem cuttings. However, as a propagation substrate amendment for other species, redcedar should be carefully evaluated.

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Table 1. Rooting percentages for stem cuttings of *Thuja* 'Green Giant' and *Ulmus parvifolia* 'Emerald Prairie' in substrates containing increasing concentrations of cedar or a perlite:peat standard.

	Thuja 'Green Giant'	*Ulmus parvifolia* 'Emerald Prairie'
Perlite:Redcedar	Rooted (%)	Rooted (%)
100:0	94 a[z]	50 ab
75:25	91 ab	36 bc
50:50	67 c	25 c
25:75	78 bc	22 c
0:100	64 c	17 c
Linear	**[y]	**
Quadratic	NS	NS
Perlite:Peat	Rooted (%)	Rooted (%)
75:25	92 ab	67 a

[z]Means followed by the same letter within a column are not statistically different based on Fisher's LSD where $P \leq 0.05$; n=36.
[y]Trend analysis: ** (highly significant; $P \leq 0.01$) or NS (not significant).