

# Growth Responses of Four Vigorous-rooted Tree Species in Cupric Hydroxide-treated Containers

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Trees with vigorous root systems produce undesirably circling, matted root systems when grown in containers. Root pruning is often required at transplanting to correct root deformation of trees produced in containers (Harris, 1992). Cupric hydroxide-treated containers reduced or eliminated root deformation in a variety of tree species (Arnold, 1992; Arnold and Struve, 1993; Beeson and Newton, 1992). In this study, I evaluated the effects of Cu(OH)<sub>2</sub>-treated containers compared to nontreated containers on final plant height, stem diameter, and root coverage of four vigorous-rooted tree species.

In Feb. 1993, uniformly graded bareroot seedling liners of *Betula nigra* L. (river birch) and *Taxodium distichum* (L.) Rich. (bald cypress) were planted in #4 (10.8-liter) containers (Nursery Supplies, Fairless Hills, Pa.) containing a 9 pine bark : 1 sand medium (v/v) supplemented with dolomite (4.2 kg·m<sup>-3</sup>), Micromax (0.9 kg·m<sup>-3</sup>; Grace-Sierra, Milpitas, Calif.), and Osmocote 18N-2.6P-10K (1.8 kg·m<sup>-3</sup>; Grace-Sierra). Uniform, potted liners of *Platanus occidentalis* L. (sycamore) and *Salix babylonica* L. (weeping willow) were planted as above in Apr. 1993. Before planting, the inside surface of half of the containers was treated with Spin Out (Griffin Corp., Valdosta, Ga.), which contains 100 g Cu(OH)<sub>2</sub>/liter in latex paint. In May 1993, all containers were topdressed with 140 g of Osmocote 16N-3.1P-10K (Grace-Sierra). Plants were grown outdoors on black plastic in a randomized complete-block design with 10 replications for each of the four species and two containers per replication (n = 20).

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Plants were evaluated in Oct. 1993 before leaf drop occurred. Plant height and stem diameter (15 cm above the soil line) were recorded. Root coverage (a visual rating of the amount of root area present at the container : growing medium interface) was rated using the scale 1 = less than 20% of the rootball covered with white root tips, no root circling; 3 = about 50% of the rootball covered with white root tips, moderate root circling; and 5 = greater than 80% of the rootball covered with white root tips, extensive root circling. Data were analyzed using SAS (SAS Institute, 1989) with mean separations by LSMEANS.

Cupric hydroxide treatment of containers did not affect height of river birch but increased stem diameter 15% over plants grown in nontreated containers (Table 1). Final height of sycamore and bald cypress was reduced by Cu(OH)<sub>2</sub> (Table 1). Our results diverge from those of others who reported increased shoot growth for bald cypress grown in containers treated with Cu(OH)<sub>2</sub> (Arnold, 1992; Arnold and Struve, 1993; Beeson and Newton, 1992) and reduced height of weeping willow in #1 containers (Beeson and Newton, 1992). Cupric hydroxide did not affect stem diameter of sycamore, bald cypress, or weeping willow (Table 1).

Table 1. Effects of Cu(OH)<sub>2</sub>-treated containers on final plant height, stem diameter, and control of root growth on four ornamental tree species.

Species	Container treatment	Ht (cm)	Stem diam (mm)	Root coverage <sup>z</sup>
River birch	+ Cu(OH) <sub>2</sub>	176 <sup>y</sup>	23.5	2.8
	- Cu(OH) <sub>2</sub>	156	20.4	4.0
	NS		*	**
Sycamore	+ Cu(OH) <sub>2</sub>	230	25.0	1.6
	- Cu(OH) <sub>2</sub>	268	27.8	5.0
	NS	*	NS	**
Weeping willow	+ Cu(OH) <sub>2</sub>	355	20.6	1.0
	- Cu(OH) <sub>2</sub>	326	20.1	5.0
	NS		NS	**
Bald cypress	+ Cu(OH) <sub>2</sub>	152	23.7	1.8
	- Cu(OH) <sub>2</sub>	171	25.4	3.7
	NS	*	NS	**

<sup>z</sup>Root coverage: 1 = less than 20% of rootball covered with white root tips, no root circling; 3 = about 50% of rootball covered with white root tips, moderate root circling; 5 = greater than 80% of rootball covered with white root tips, extensive root circling.

<sup>y</sup>Means of 10 replications.

NS, \*, \*\*Nonsignificant at  $P > 0.05$  or significant at  $P \leq 0.05$  or 0.01, respectively.

Cupric hydroxide decreased root coverage on all four species (Table 1). Krieg and Witte (1993) noted good control of root growth with Cu(OH)<sub>2</sub> on river birch, but we found poor control of root growth in the lower half of the container. Loss of root growth control on the bottom of the container was also noted for sycamore and bald cypress. Root circling in the bottom of containers treated with Cu(OH)<sub>2</sub> has been noted for bald cypress (Beeson and Newton, 1992).

Treating containers with Cu(OH)<sub>2</sub> reduced root circling and the number of visible white root tips on all four ornamental tree species, but control of root growth varied among species. Complete root coverage control occurred only with weeping willow grown in Cu(OH)<sub>2</sub>-treated containers. The slight reduction in plant height of sycamore and bald cypress likely would benefit the grower of these fast-growing species because final plant height in #4 containers is commonly excessive in proportion to container size.

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