Using Copper Compounds to Modify Roots on Container-grown Trees

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INTRODUCTION

Girdling roots—roots which grow around tree stems and other roots—may shorten a tree's life span if they constrict the vascular system and restrict water and nutrient movement or if they fail to anchor the tree adequately (Gouin, 1984; Holmes, 1984; Whitcomb, 1984). Girdling roots generally start in one of three ways:

1) Plants may be put in planting holes with glazed clay walls that restrict structural development and cause roots to circle;

2) new lateral roots may develop behind the ends of primary roots that are cut during field-grown nursery stock harvesting (Watson et al., 1990);

3) or roots may circle on the outside of the medium root ball for container-grown trees.

A common planting recommendation for circling roots resulting from container production, has been mechanical disruption, slicing or "butterflying," of the root ball (Flemer, 1982; Gouin, 1984). The value of these practices, however, is questionable, according to limited and contradictory research conducted primarily using shrubs (Blessing and Dana, 1987; Wade and Smith, 1985; Wright and Milbocker, 1978).

REDUCING CIRCLING ROOTS USING MODIFIED CONTAINERS

A variety of modified containers have been developed in an effort to solve the problem of circling root formation during production. Conventional plastic containers, which generally have rigid, straight, and smooth walls; have had ribs, holes, baffles, and other root deflecting or air-pruning devices designed into their walls to reduce or eliminate circling root formation.

These various wall modifications, and a flexible poly-bag container, have significantly reduced circling root formation on many species of plants (Appleton, 1989; Warren and Blazich, 1991; Whitcomb, 1984; Whitcomb and Williams, 1985), although sometimes with conflicting results relative to shoot growth (Newman and Follet, 1987; Whitcomb, 1984). Once planted in the landscape, Warren and Blazich (1991) found the effectiveness of the modifications in enhancing new root generation to be species specific.

Privett and Hummel (1992) found that a porous-walled container with pin-hole perforations randomly punctuating the container walls produced roots superior to those in nonporous smooth and nonporous ridged containers. Air root pruning behind the perforations prevented circling root formation except where the plastic was denser and container air porosity was limited.

Although trees generally cannot be grown in the ground in single plastic

containers due to drainage problems, a rigid plastic container has been developed with rows of small holes around the container sides and bottom to minimize these problems. No comparative tests have been reported as yet, but the potential for circling root formation appears minimal (personal observation).

Another new development is an above-ground container that combines a porous foam-rubber liner with wire baskets used to protect field-grown tree root balls (Tilt, 1992). Called the "Soil Sock" (Better Bilt Products, Inc., P.O. Box 559, Addison, IL 60101-0559; 1-800-544-4550), the foam-rubber liner insulates the roots against temperature extremes while allowing air penetration, which air-prunes the roots and prevents circling root formation. The container sits above ground for production but is reported by the manufacturer to be entirely plantable. It is currently being tested by the author for transplantability and circling root reduction.

REDUCING CIRCLING ROOTS USING COPPER-COATED CONTAINERS

A new approach to the reduction or elimination of circling root formation is the use of rigid plastic containers with copper-coated interior walls (Struve and Rhodus, 1990). The copper in a liquid carrier is painted or sprayed on the walls and is absorbed by the root tips. The copper acts as a growth regulator, inhibiting root tip growth and stimulating branching.

A currently available copper product is SpinOut™ (Griffin Corporation, P.O. Box 1847, Valdosta, GA 31603-1847; 1-800-237-1854). The manufacturer claims that root tips are not killed by the copper as they are with air-pruning.

The effectiveness of the copper has been demonstrated on a large number of trees

Figure 1. Left. Root ball of a lacebark elm (*Ulmus parvifolia*) grown in a copper-coated container. Note that no roots are visible on the outside of the medium. Right. Fibrous root system of a lacebark elm grown in a copper-coated container, medium removed.

Figure 2. Left. Root system of a sawtooth oak (*Quercus acutissima*) grown in an uncoated container. Note major circling taproot at the bottom of the root ball. Right. Root system of a sawtooth oak grown in a copper-coated container. Note taproot has been eliminated and root system is more fibrous and evenly distributed throughout the entire root ball.

and shrubs (Arnold, 1992; Arnold and Young, 1991; Beeson and Newton, 1992; Flanagan and Witte, 1991, 1992; Struve and Rhodus, 1990). Results range from virtually no visible roots on the outside of root balls to roots whose tendency to circle is stopped after one to two inches of growth. No impairment of root growth into the surrounding soil has been reported for trees and shrubs after copper-coated container removal and field transplanting.

The only containers thus far developed with copper incorporated into the container walls are fiber (peat/paper) containers (Root Works^{R}, Keiding, Inc., 4545 W. Woolworth Ave., Milwaukee, WI 53218; 1-800-346-0898). Appleton and Salzman (1993) reported that these containers have been very effective at preventing roots from matting on the outside of azalea root balls, but thus far no reports have been published on their effect on tree roots.

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