Multiple Uses of Spin Out® in the Nursery and Landscape

Mark A. Crawford
Griffin L.L.C. , P. O. Box 1847, Valdosta, Georgia 31603

INTRODUCTION

The benefits of using copper salts in a latex carrier to control root development in containers has been well documented in the literature and has gained widespread use in forestry and nursery crop production with the introduction of pretreated containers in the 1990s. Using copper to control root growth in containers to eliminate root spiraling first began in forest seedling production in the 1960s and has increased to where greater than 90% of lodgeple pines produced in British Columbia are grown in copper-treated containers. Horticultural research at Ohio State University demonstrated the benefits of controlling roots in container-grown red oaks (*Quercus rubra*). This caught the attention of Griffin Corporation, which is a major producer of copper fungicides. In 1994, Griffin introduced Spin Out® root growth regulator, which is the first EPA registered product for controlling plant root growth in containers.

USE OF SPIN OUT® IN CONTAINER PRODUCTION

Spin Out® was specifically formulated as a stable, ready-to-use product to be applied to the inner surfaces of plant containers to control undesirable root growth and produce plants with high root regeneration potential. The active ingredient in Spin Out is copper hydroxide. Copper hydroxide has been used for over 30 years for disease control on crops throughout the world and is considered the best source of copper for copper-based fungicides/bactericides. Spin Out has been formulated to adhere to plastic nursery containers where the copper coating remains in place to control root growth only along the container wall. It is easily applied to the inner surfaces of new and used containers using conventional spray paint equipment. It was also formulated to reduce the problems of copper-induced iron chlorosis, which can occur with mixtures of household latex paint and copper carbonate. When root tips reach the sides of the container, the Spin Out coating inhibits root elongation and deflection and stimulates root branching. As the plant produces new roots, they in turn will be pruned, resulting in a very fibrous root system. Spin Out prevents the "cage root" condition where roots are only present on the outside of the root ball. In a typical black nursery container, 80% of the roots are within 1 inch of the container wall. Instead, the roots are able to utilize all the available potting medium. An improvement in root distribution can lead to an improvement in the nutrient status and health of the plant which will encourage more rapid growth during upcanning or transplanting. An increase in flowering has been demonstrated with lantana grown in Spin Out -treated containers during greenhouse production. With the absence of circled and matted roots, no mechanical root pruning is required at transplanting resulting in fewer sites where root diseases can enter the plant. Also, heat stress associated with black nursery containers is reduced in Spin Out -treated containers. Using Spin Out allows the root system to be more evenly distributed

through the soil, thereby reducing the mass of roots which come in contact with the edge of the container that are most vulnerable to temperature extremes. Spin Out also makes removal of plants from containers easier since the roots do not adhere to the plastic or styrofoam. This benefit is referred to as the "Teflon effect".

Most of the research with Spin Out has been on ornamental trees, shrubs, and herbaceous annuals and perennials grown in containers ranging in size from 1 to 100 gal (3.8 to 379 liters). Initially, Spin Out was developed and marketed as a user-applied coating where growers applied the product to containers at the nursery. Growers found the product very effective but were resistant to the time and inconvenience of application. This led to Griffin forming a partnership with the Lerio Corp., a container manufacturer, in 1996, to supply pretreated pots and propagation trays to the market. Pretreated propagation trays are produced by a patent pending process where flat polystyrene sheet is coated with Spin Out and then formed into a tray. This represents a significant reduction in the cost and time to produce treated trays and the coating rate is specific to cell size. A full line of pretreated plastic trays with a range of cell sizes and depths are available from Lerio. Plants rooted from cuttings stuck in Spin Out-treated cell trays can develop more roots from the stem. This results in more uniform root distribution around the stem and more stable plants as they increase in size.

In developing countries where rigid containers are too expensive, Griffin has developed polybags pretreated with Spin Out. Treated polybags are being tested on numerous forestry, nursery, and orchard crops in several countries as a cost-effective way to solve root and survival problems associated with polybag culture.

Spin Out can be incorporated into fiber pots made from recycled paper. Fiber pots have been used for nursery plant production for many years, but are limited to regions with cool climates like the Pacific Northwest and the Northeast. In the Southeastern United States, fiber pots cannot be used for plant production because they decompose within 2 to 3 months and become too soft to transport. When Spin Out is incorporated into fiber pots, it extends the life of the pots for up to 2 years by slowing down the decomposition. One of the primary advantages of fiber pots in hot climates is they are porous and provide a cooler root environment compared to standard black plastic nursery pots. Plants sensitive to high root temperatures, like conifers and herbaceous perennials, are more easily grown in fiber pots. Spin Out also prevents root growth into the fiber, making it easier to remove the pot for transplanting.

USE OF SPIN OUT IN GEOTEXTILE FABRICS

The development of Spin Out has lead to many other uses for root and pest management in nurseries, greenhouses, and in the landscape. Griffin has teamed up with Texel, Inc. of Quebec, Canada, to provide geotextile fabrics pretreated with Spin Out. Spin Out-treated groundcover fabric prevents weed establishment in decorative mulches for up to 5 years. For weed control in containers, Spin Out-treated nonwoven fabric is cut into circles or discs (Geodiscs™) and placed on the tops of pots to control weeds as an alternative to herbicides. When weed seeds germinate, the roots are pruned, preventing weed establishment and the seedling dies. Water is able to pass through the fabric since coated fabrics remain porous. Controlled-release fertilizers can be placed either under the disc or on top. The placement of Geodiscs™ is important. For best performance use single plants placed

in the center of the container where the medium is a least 1.3 cm (0.5 inch) below the rim of the pot. Geodiscs™ can be used on container-grown fruit trees and shrubs where herbicides cannot be used.

Spin Out-treated geotextile fabrics can be used to replace air pruning under plastic propagation trays where the coating prunes the roots as they emerge from the drain holes. Treated fabrics can also be used to cover capillary sandbeds (a type of subirrigation) to control roots growing from the drainage holes of containers, as well as weeds, liverworts, and several types of algae. In England, the use of sandbeds was declining when herbicides used to control root growth into the sand were discontinued due to groundwater issues. The commercial introduction of two pretreated fabrics, Supercover Plus™ (Fargro Ltd, England) and Tex-R® fabric (Texel Inc., Quebec, Canada), have saved the use of sandbeds. Research in England has demonstrated that treated fabrics will control zoospores of *Phytophthora cryptogea* and reduce the spread of disease from infected to noninfected plants on a sandbed. Other research in Oregon, Hawaii, and Canada has demonstrated that slugs and snails are repelled by the Spin Out coating on fabrics. It may be possible to keep plants free of slugs and snails by placing containers on treated fabric or by coating the surface under containers.

Spin Out-treated fabric (Tex-R) can be used between the socket and growing pots for pot-in-pot production to control rooting-out. Problems occur with pot-in-pot when roots grow out of the drain holes of the growing pot into the socket pot and then into the surrounding soil, thus preventing the plant from being hand harvested. Spin Out-treated fabric provides a physical and chemical barrier to reduce escaped roots.

Spin Out can be used to control undesirable root growth on root control barriers used in the landscape around pavement, foundations, curbing, and retaining walls (hardscape). Undesirable root growth is a major problem and expense in the urban environment where arborists maintain a healthy urban forest. Texel has developed a fabric root barrier as an alternative to Biobarrier® (trifluralin-impregnated fabric produced by Reemay, Inc.) to divert roots under sidewalks and other hardscape. Fabric barriers have an advantage over rigid barrier as they allow for the movement of water. The Spin Out coating on the fabric barrier modifies the root system as it develops and prevents large roots from deflecting along the barrier, growing down and then under the base of the barrier. By modifying the root system adjacent to the barrier, the life of the barrier is extended and the root system is more effectively redirected under the hardscape.

In Japan, paper sheets are treated with Spin Out and placed under the soil in flats used to grow rice and onion seedlings for transplanting. This treatment eliminates the root mat on the bottom of seed flats and decreases the time to separate the small plants. The decrease in root damage at transplanting has resulted in yield improvements up to 10%. Spin Out is also registered for use as a tree wound and pruning paint.

PROBLEMS WITH COPPER-INDUCED CHLOROSIS

The most significant problem encountered when growing in treated containers is copper-induced iron chlorosis. This condition is most common in cell trays where there is a high container surface area to low soil volume ratio. Iron (deficiency) chlorosis results from low availability of active ferrous (Fe^{+2}) ions in newly forming

Table 1. Reduction in top growth observed in plants propagated in Spin Out-treated cell trays.

Tissue Culture	Propagation method	
	Cuttings	Seed
Leucanthemum (Shasta Daisy)	*Heuchera* 'Mt. St. Helens'	*Asparagus densiflorus*
Ficus benjamina	*Murraya paniculata*	*Schefflera arboricola*
Musa acuminata 'Dwarf Cavendish'	*Viburnum odoratissimum*	
Anthurium	*Viburnum suspensum*	
Syngonium	*Viburnum tinus*	
Deffenbachia	*Cissus rhombifolia*	
Globba winitti	*Hypoestes phyllostachya* 'Splash'	
Liriope muscari		
Spathiphyllum		
Guzmania		
Philodendron 'Black Cardinal'		
Maranta leuconeura var. *erythroneura*		

plant organs. Because copper competes with iron for uptake at the root tip, it reduces the relative availability of iron at any fertilizer rate. Hence, copper can exacerbate an existing iron deficiency or bring on an impending one sooner. This condition is easily corrected by applying supplemental iron fertilizer.

Spin Out has been tested on over 300 species of plants with very few occurrences of phytotoxicity. Plants that have been identified as sensitive to copper root pruning are listed in Table 1.

SUMMARY

In summary, Spin Out was developed as a ready-to-use copper coating to help nursery growers control root growth in containers, but has been found to provide many other benefits depending on the substrate it is applied to and the problem the grower wants to solve. Providing pretreated pots, propagation trays, fabric, and paper has made Spin Out very versatile and easy for the grower to use to solve root problems in the nursery and landscape.

LITERATURE CITED

Arnold, M.A. and **D.K. Struve**. 1993. Root distribution and mineral nutrient uptake of coarse-rooted trees grown in cupric hydroxide-treated containers. HortScience 28(10):988-992.

Henley, R.W. 1995. Growth responses of 35 ornamental plants to propagation in liner trays coated with a product containing copper hydroxide. Proc. Fla. State Hort. Soc. 108:16-22.

Labous, P. and **S. Willis**. 1997. Water recycling trials in hardy stock production 1996. The Horticulturist 6(2):30-32.

Ruter, J.M. 1995. Growth of *Coreopsis* and *Plumbago* in plastic and $Cu(OH)_2$-impregnated fiber containers. HortTechnology 5(4):300-302.

Ruter, J.M. 1994. Evaluation of control strategies for reducing rooting-out problems in pot-in-pot production systems. J. Environ. Hort.12(1):51-54.

Saul, G. 1968. Copper safely controls roots of tubed seedlings. USDA Tree Planters Notes. 19:7-9.

Struve, D.K., M.A. Arnold, R. Beeson Jr., J.M. Ruter, S. Svenson, and **W.T. Witte**. 1994. The copper connection. Amer. Nurseryman 179(4):52-61.

Svenson, S.E. and **D.L. Johnston**. 1995. Rooting Cuttings in cupric hydroxide-treated pots affects root length and number of flowers after transplanting. HortScience. 30(2):247-248.

Van Steenis, E. 1994. Growing in copper treated containers requires greater awareness. BC Silviculture 7:(2)4-5.