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Efficacy of Five Pre-emergence Herbicides in Pot-in-Pot Tree Production©

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INTRODUCTION

Interest and installation of pot-in-pot systems for production of trees and shrubs continues to grow throughout the nation (Mathers, 2000). Pot-in-pot systems offer numerous benefits for production nurseries and retail outlets including improved root growth during the hot summer months, elimination of tree blow-over, reduced need for overwintering structures, reduced water usage, less impact on field soil and loss of organic matter, and year-round harvest potential (Fidler, 1999). Year-round harvest also means a potential for increased weed management requirements. Traditionally, weed control in field production nurseries employ mechanical cultivation in combination with pre-emergence and postemergence herbicide applications. Similarly, container production nurseries employ a variety of techniques to maintain weed-free growing areas including well-drained gravel, concrete or geotextile covered surfaces, soilless growing media for nursery stock, pre-emergence herbicides, and dormant overwintering conditions to manage weed growth and development (Derr et. al., 1997). The hybrid nature of pot-in-pot production employs characteristics of both field and container growing techniques and environments providing increased opportunity for weed establishment. In order to examine weed control options and to develop weed control management strategies for a variety of trees, this preliminary study was initiated to determine the efficacy of five pre-emergence herbicides for managing weeds in a pot-in-pot system.

METHODS AND MATERIALS

A 400-container pot-in-pot nursery, consisting of four blocks with five 110 ft long rows each containing twenty #20 grip-lip poly containers (Nursery Supplies, Inc.,

Chambersburg, Pennsylvania) offset spaced 5 ft within rows and 5.5 ft on centers between rows, was installed at The Pennsylvania State University Landscape Management Research Center at University Park, Pennsylvania. The nursery included 20 bare-root trees of *Betula nigra* 'Cully' Heritage® riverbirch, *B. populifolia* 'Whitespire', *Platanus ×hispanica* 'Bloodgood', *B. papyrifera*, *Carpinus betulus*, *C. betulus* 'Fastigiata', *Tilia americana* 'Redmond', *T. tomentosa*, *Tilia cordata* PNI6025, Greenspire® littleleaf linden, *Corylus colurna*, *Pyrus calleryana* Aristocrat™ flowering pear, *Gleditisa triacanthos* f. *inermis* 'Christie', Halka™ thornless honey locust, *Celtis occidentalis*, *Gymnocladus dioica*, *Koelreuteria paniculata*, *Zelkova serrata*, Green Vase® zelkova, *Crataegus crus-galli* var. *inermis*, *Cladrastis kentukea* (syn. *C. lutea*), *Quercus macrocarpa*, and *Q. palustris* ranging in caliper from 1/2 to 1 inch at a point 6 inches above the soil line. The trees were planted the week of 14 April 2001 in Fafard 52 (FAFARD Inc, Agawam, MA) pine bark medium supplemented with 320 grams of Osmocote plus (15-9-12) (Scotts-Sierra Horticultural Products Co., Marysville, Ohio) and placed in the nursery in individual rows.

The experiment was a randomized complete block design with treatments applied along each 110-foot row. The experiment consisted of five treatments per block and four replicates per treatment. Prior to treatment all rows received 1 qt per acre Roundup Pro to eliminate any pre-germinated weeds that may be within the pots. The treatments included an untreated control, Simazine (Princep) 4L + Oryzalin (Surflan) 4AS, Isoxaben (Gallery) 75DF + Oryzalin (Surflan) 4AS, Oxyfluorfen (Goal) 2XL + Oryzalin (Surflan) 4AS, and Snapshot (Treflan + Gallery) 2.5G (Table 1). Applications were made with a CO_2 test plot sprayer at 30 psi through an OCO_4 nozzle on 11 May 2001. Treatments were applied in 18-inch wide strips to both sides of the tree rows. Approximately 4 to 6 inches of the lower part of each trunk was covered with the spray solution. The system had an output equivalent to 36 gal per

Table 1. Weed counts for pre-emergence applications on a pot-in-pot tree production system at the Pennsylvania State University. Weed control was evaluated 8 and 11 weeks after treatment, and averaged over three replicates.

Treatments	Herbicides	ai per acre (lb)	Total average number of weeds[x]
1	Control		120 a
2	Simazine 4L	2	32 ab
	Oryzalin 4AS	2	
3	Isoxaben 75DF	1.1	30 ab
	Oryzalin 4AS	2	
4	Oxyfluorfen 2XL	0.5	11 b
	Oryzalin 4AS	2	
5	Treflan & Gallery 2.5G	3.75	45 ab

[x] Means within columns, followed by the same letter, do not differ at the 5% level of significance (DMRT).

acre. The temperature was 80°F, and winds were 3 to 5 mph. Plant quality, weed control, and weed count data was collected and evaluated on 9 Aug. 2001.

RESULTS AND DISCUSSION

The following weeds were present in the control plots and in at least one other treatment 8 weeks after application: dandelion (*Taraxacum officinale*), carpetweed (*Mollugo verticillata*), oxeye daisy [*Leucanthemum vulgare* (syn. *Chrysanthemum leucanthemum*)], prickly lettuce (*Lactuca serriola*), shepherd's purse (*Capsella bursa-pastoris*), common lambsquarters (*Chenopodium album*), common groundsel (*Senecio vulgaris*), marestail (*Hippuris vulgaris*). Yellow foxtail (*Setaria glauca*), hairy bittercress (*Cardamine hirsuta*), witchgrass *(Panicum capillare*), common purslane *(Portulaca oleracea*), tumble pigweed (*Amaranthus albus*), yellow woodsorrel (*Oxalis stricta*), and common chickweed (*Stellaria media*) were only present in the control plots. Kochia [*Bassia scoparia* (syn. *Kochia scoparia*)] was present in one plot treated with Snapshot. Dandelion, carpetweed, and common groundsel were the most common weeds with dandelion populations predominating. This was in part due to a large established dandelion population within the surrounding fields, which seeded heavily prior to and after the treatments were applied.

Each of the pre-emergence herbicides was effective in reducing weed activity compared to the control. The oxyfluorfen + oryzalin treatments were significantly more effective in controlling weeds compared to the control, whereas the simazine + oryzalin and isoxaben + oryzalin reduced weed populations but were not significantly different than the control. The Snapshot treatment was least effective. The Treflan & Gallery and oxyfluorfen + oryzalin, treatments may have been less effective due to the lack of rainfall immediately following the application. Similarly, simazine is more effective when applied and covered with mulch or incorporated through irrigation. The effectiveness of the oxyfluorfen + oryzalin treatments is very likely due to the fact that it requires light activation to be effective.

CONCLUSIONS

All treatments were relatively effective in controlling weed growth within the containers. Weed seed pressure outside the production area combined with poor incorporation will reduce herbicide effectiveness. Weed control trials will continue throughout the year in order to develop recommendations and production cost data for pot-in-pot production weed management.

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