Field Evaluation of Preemergence Herbicides for Weed Control In Container Grown Woody Landscape Plants[1]

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Abstract

Four preemergence herbicide combinations were evaluated for weed control and phytotoxicity on Silverberry (*Elaeagnus pungens* Thunb.), Spanish bayonet (*Yucca aloifolia* L.), and Heavenly bamboo (*Nandina domestica* Thunb.), grown in 3.8 l (1 gal) containers under commercial nursery conditions. Combinations of Rout (oxyfluorfen : oryzalin) and Rout GL (oxyfluorfen : alachlor) were applied as granules at 1.12 : 0.56, 2.24 : 1.12 and 4.48 : 2.24 and 1.12 : 1.12, 2.24 : 2.24, and 4.48 : 4.48 kg ai/ha (1.0 : 05, 2.0 : 1.0, and 4.0 : 2.0 and 1.0 : 1.0, 2.0 : 2.0 and 4.0 : 4.0 lb ai/A), resp. Harness (acetochlor) was applied as a foliar spray at 1.68, 3.36 and 6.68 kg ai/ha (1.5, 3.0 and 6.0 lb ai/A) and Zorial (norflurazon) was applied at 1.12, 2.24 and 4.48 kg ai/ha (1.0, 2.0 and 4.0 lb ai/A) as a soil drench. Containers were overseeded with a weed mixture prior to herbicide application and six weeks later to induce extreme weed competition in containers. Harness, Rout GL and Rout provided 90–100% control for up to 14 weeks after application at the highest rates evaluated. Zorial resulted in unsatisfactory weed control. None of the herbicides caused any phytotoxic effects on any of the plants tested.

Index words: herbicide, weed control, landscape plants
Species used in this study: Silverberry (*Elaeagnus pungens* Thunb.): Spanish bayonet (*Yucca aloifolia* L.): and Heavenly bamboo (*Nandina domestica* Thunb.)
Herbicides used in this study: Rout (oxyfluorfen : oryzalin) 2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluormethyl) benzene: 3, 5-dinitro-N^4-N^4-dipropylsulfanilamide: Rout GL (oxyfluorfen : alachlor) 2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluormethyl) benzene: 2-chloro-2′, 6′-diethyl-*N*-(methoxymethyl) acetanilide: Harness (acetochlor) 2-chloro-*N* (ethoxymethyl)-6′-ethyl-*o*-acetotoluidide: Zorial (norflurazon) 4-chloro-5-(methylamino)-2)α, α, α-trifluro-*m*-totyl)-3(2*H*)-pyridazinone.

Introduction

Controlling weeds in container nursery stock is a major production problem and expense. Padgett and Frazier (4) reported that 624 man hours were required to remove weeds from one acre of 3.8 l (1 gal) containers. Fretz (3) found that weeds reduce size and marketability of nursery stock grown in containers. Numerous studies have been conducted to evaluate herbicide efficacy and crop tolerance to herbicides for container use (2, 5, 6). New herbicides must continue to be evaluated to extend and improve the spectrum of weed control possible in container grown landscape plants.

In this study, four preemergence herbicides were evaluated for weed control and efficacy on landscape plants. Rout GL and Rout are combinations of oxyfluorfen and alachlor and oxyfluorfen and oryzalin, respectively. Combining these nursery herbicides may improve the spectrum of weed control within one herbicide application.

Zorial (norflurazon) controls a wide variety of weeds including grasses, sedges and broadleaves. Cotton, citrus, cranberries and many stone fruits are tolerant of Zorial. Zorial does not leach appreciably in the field and has a relatively long soil persistence (1). Such a herbicide may be useful in increasing the persistence and spectrum of weeds controlled in container grown landscape plants.

Harness (acetochlor), an acetanilide, has been shown to have similar characteristics to Lasso (alachlor). However, Harness is superior to Lasso especially on broadleaf annual weeds and on certain perennial weeds. Weber et al. (7) observed that Harness may be more effective in higher organic matter soils than Lasso mainly due to increased water solubility. This may be especially useful in the high organic matter medium used in containers. In addition, Harness has an average persistence of 8 to 12 weeks, whereas Lasso has an average persistence of 6 to 10 weeks (3). Consequently, Harness may have potential for use on plants grown in containers.

This study was conducted to evaluate weed control, persistence and crop phytotoxicity of four herbicides under extreme weed competition in a commercial nursery.

Materials and Methods

The experiment was conducted under commercial production conditions at Greenleaf Nursery, El Campo, Texas. A completely randomized design was used, with fifteen plants per species per treatment. Plant species evaluated included *Elaeagnus pungens, Nandina domestica,* and *Yucca aloifolia*. All plants were shifted from liners into 3.8 l (1 gal) containers prior to herbicide application on June 11, 1984. Herbicide treatments included Harness at 1.68, 3.36, and 6.68 kg ai/ha (1.5, 3.0 and 6.0 lb ai/A), Rout GL at 1.12 : 1.12, 2.24 : 2.24, and 4.48 : 4.48 kg ai/ha (1.0 : 1.0, 2.0 : 2.0, and 4.0 : 4.0 lb ai/A), Rout at 1.12 : 0.56, 2.24 : 1.12, and 4.48 : 2.24 kg ai/ha (1.0 : 0.5, 2.0 : 1.0, and 4.0 : 2.0 lb ai/A), and Zorial at 1.12, 2.24, and 4.48 kg ai/ha (1.0, 2.0, and 4.0 lb ai/A). Harness was applied as a foliar spray, Zorial as a media drench, and Rout and Rout GL as surface-applied preweighed granules. Containers were overseeded prior to herbicide application with a 3 g weed mixture consisting of *Poa annua* L. (annual blue-

[1]Received for publication November 22, 1988; in revised form June 12, 1989. Texas Agricultural Station Journal Series TA 24241. This research was supported in part by a grant from the Horticultural Research Institute. We gratefully thank Greenleaf Nursery, Inc., El Campo, TX for donation of plant materials and use of their production facilities.

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grass), *Echinochloa crus-galli* (L.) Beauv. (barnyard grass), *Digitaria sanguinallis* (L.) Scop. (large crabgrass), *Setaria glauca* (L.) Beauv. (yellow foxtail), *Eleusine indica* (L.) Gaertn. (goosegrass), *Taraxacum officinale* (dandelion), *Amaranthus retroflexus* L. (redroot pigweed), *Chenopodium album* (L.) (common lambsquarter), *Ambrosia artemisiifolia* (common ragweed), *Portulaca oleracea* L. (common purslane), and *Euphorbia maculata* L. (spotted spurge). Indigenous weed species supplied additional weed pressure.

Initial ornamental plant heights were recorded on June 11, 1984. On July 24, 1984 weed counts were taken, phytotoxicity observed, and containers were again overseeded with the same mixture to insure heavy weed stands. The experiment was terminated on September 19, 1984 when final ornamental heights were measured and weed shoots were harvested for dry weight analysis.

Results and Discussion

No phytotoxicity was noted on any of the landscape plants with any herbicide at any rate during the experiment period (data not shown). All herbicides evaluated demonstrated some degree of weed control as compared to the untreated control (Tables 1 and 2). All rates of Harness significantly increased weed control over the untreated control, however only the highest rate (6.68 kg/ha or 6.0 lb/A) afforded excellent (90%+) broadleaf and grass control. In contrast, Zorial treatments resulted in unsatisfactory weed control at all rates tested. Grass and broadleaf competition was severe with as many as 25 weeds present in the 3.8 l (1 gal) containers. Rout GL and Rout resulted in good weed control at the medium and high rates tested. Rout afforded better weed control than Rout GL, particularly in *Yucca aloifolia*.

Table 1. Effects of herbicides in container grown landscape plants on weed biomass.[z]

Herbicide	Rate kg ai/ha	Rate (lb ai/A)	*Elaeagnus pungens* Grasses	*Elaeagnus pungens* Broadleaves	*Nandina domestica* Grasses	*Nandina domestica* Broadleaves	*Yucca aloifolia* Grasses	*Yucca aloifolia* Broadleaves
			Weed dry wt (g)					
Control	-	(-)	31.9 a[y]	0.9 a	38.5 a	0.4 a	31.8 a	0.2 a
Harness	1.68	(1.5)	7.5 b	0.1 a	7.9 bc	0.3 a	8.3 cde	0.3 a
	3.36	(3.0)	7.4 b	1.1 a	6.9 bc	0.1 a	5.3 de	0.1 a
	6.68	(6.0)	1.9 b	0.0 a	1.7 c	0.0 a	0.0 e	0.0 a
Zorial	1.12	(1.0)	6.8 b	0.6 a	10.2 bc	0.0 a	26.7 ab	0.9 a
	2.24	(2.0)	2.2 b	1.0 a	7.4 bc	0.5 a	14.8 bcde	0.5 a
	4.48	(4.0)	9.5 b	0.0 a	6.4 bc	3.7 a	5.6 cde	0.1 a
Rout GL	1.12:1.12	(1.0:1.0)	12.4 b	0.1 a	20.6 b	0.0 a	18.6 abcd	0.0 a
	2.24:2.24	(2.0:2.0)	0.0 b	1.0 a	6.2 bc	0.0 a	22.8 abc	0.0 a
	4.48:4.48	(4.0:4.0)	0.0 b	0.7 a	6.1 bc	0.0 a	19.3 abcd	0.6 a
Rout	1.12:0.56	(1.0:0.5)	0.7 b	0.0 a	34.6 a	0.0 a	12.5 bcde	0.7 a
	2.24:1.12	(2.0:1.0)	1.6 b	0.9 a	8.7 bc	0.0 a	6.5 cde	0.0 a
	4.48:2.24	(4.0:2.0)	0.0 b	0.0 a	0.0 c	0.0 a	3.4 de	0.0 a

[z]Evaluations taken 14 weeks after application on September 22, 1984.

[y]Mean separation within column by Duncan's multiple range test, 5% level.

Table 2. Effects of herbicide and application rate on weed population in container grown landscape plants.[z]

Herbicide	Rate kg ai/ha	Rate (lb ai/A)	*Elaeagnus pungens* Grasses	*Elaeagnus pungens* Broadleaves	*Nandina domestica* Grasses	*Nandina domestica* Broadleaves	*Yucca aloifolia* Grasses	*Yucca aloifolia* Broadleaves
			Weed no/container					
Control	-	(-)	3.9 a[y]	3.7 a	5.5 a	3.7 a	3.3 a	7.0 a
Harness	1.68	(1.5)	0.9 bc	0.9 bc	1.3 cd	1.8 bc	0.1 c	0.1 de
	3.36	(3.0)	0.3 c	0.5 bcd	0.3 d	0.9 c	0.0 c	0.0 e
	6.68	(6.0)	0.0 c	0.0 d	0.0 d	0.4 c	0.0 c	0.0 e
Zorial	1.12	(1.0)	1.4 b	1.3 b	2.9 b	2.9 ab	1.0 b	3.1 b
	2.24	(2.0)	0.9 bc	1.2 b	1.5 bcd	3.4 a	0.7 bc	1.5 cd
	4.48	(4.0)	0.7 bc	0.9 bc	1.1 cd	3.5 a	0.3 bc	2.5 bc
Rout GL	1.12:1.12	(1.0:1.0)	0.5 c	0.3 cd	0.9 cd	0.5 c	0.7 bc	1.2 cde
	2.24:2.24	(2.0:2.0)	0.1 c	0.1 cd	0.9 cd	0.7 c	0.7 bc	0.3 de
	4.48:4.48	(4.0:4.0)	0.7 bc	0.6 bcd	0.0 d	0.4 c	0.7 bc	2.3 bc
Rout	1.12:0.56	(1.0:0.5)	0.4 c	0.2 cd	2.3 bc	1.0 c	0.6 bc	2.3 bc
	2.24:1.12	(2.0:1.0)	0.4 c	0.2 cd	1.5 bcd	0.9 c	0.2 c	0.1 de
	4.48:2.24	(4.0:2.0)	0.0 c	0.0 d	0.3 d	0.3 c	0.3 bc	0.2 de

[z]Evaluations taken 6 weeks after application on July 24, 1984.

[y]Mean separation within column by Duncan's multiple range test, 5% level.

Table 3. Effects of herbicide and application rate on height (cm) of container grown landscape plants.[z]

Herbicide	Rate kg ai/ha	Rate (lb ai/A)	*Elaeagnus pungens*	*Nandina domestica*	*Yucca aloifolia*
Control	-	(-)	18.6 b[y]	3.3 d	12.5 d
Harness	1.68	(1.5)	24.0 ab	5.0 cd	18.5 a
	3.36	(3.0)	27.8 a	8.4 b	18.5 a
	6.68	(6.0)	29.7 a	8.5 b	18.1 a
Zorial	1.12	(1.0)	27.3 a	8.9 ab	14.7 cd
	2.24	(2.0)	22.6 ab	8.9 ab	15.3 bcd
	4.48	(4.0)	27.3 a	8.6 b	17.8 ab
Rout GL	1.12:1.12	(1.0:1.0)	27.4 a	8.1 b	14.8 cd
	2.24:2.24	(2.0:2.0)	27.7 a	9.4 ab	14.5 cd
	4.48:4.48	(4.0:4.0)	29.5 a	12.1 a	16.7 abc
Rout	1.12:0.56	(1.0:0.5)	26.3 a	6.7 bc	16.6 abc
	2.24:1.12	(2.0:1.0)	25.4 a	8.3 b	18.3 a
	4.48:2.24	(4.0:2.0)	28.4 a	9.2 ab	16.9 abc

[z]Evaluations taken 14 weeks after application on September 22, 1984.

[y]Mean separation within column by Duncan's multiple range test, 5% level.

This may be due to the growth of this plant, where the greater light penetration through the canopy would permit better weed establishment compared to *Nandina* and *Elaeagnus* which shaded the container media surface. *Amaranthus retroflexus* control was superior with the Rout treatment as compared to Rout GL.

All of the herbicides tested except Zorial exhibited better weed control as herbicide rates increased. Plant heights generally increased as weed competition decreased (Table 3). Differences among species may be attributed to growth forms of each plant species and subsequent canopy effect and shading on weed competition.

Significance to the Nursery Industry

This study indicates that under artificially high weed pressure in a commercial nursery, Harness, Rout GL and Rout were safe and effective herbicides in selected container grown landscape plants. Of the 4 herbicides tested Harness (foliar application) and Rout (granular application) generally gave best weed control.

Ed. note: This paper reports the results of research only, and does not imply registration of a pesticide under amended FIFRA. Before using any of the products mentioned in this research paper, be certain of their registration by appropriate state and/or federal authorities.)

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