Auburn University
Southern Forest Nursery
Management Cooperative

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HERBICIDE TRIALS WITH RIMSULFURON AND DIMETHENAMID IN LOBLOLLY PINE SEEDBEDS

by
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INTRODUCTION

Researchers with the Auburn University Southern Forest Nursery Management Cooperative have been looking for a selective herbicide for controlling nutsedge (*Cyperus* spp.) since 1971. Rimsulfuron (Matrix®) is a pyrimidinylsulfonylurea herbicide that is registered for use in potatoes, tomatoes, citrus, and tree nuts like almond (Hansen 2008), chestnut, hickory nut, pecan and walnut. According to the label, it provides some preemergence control of yellow nutsedge and some "partial" control when applied after nutsedge emergence. In some crops, postemergence applications at 0.5 oz a.i./acre provided 51 to 63% control of purple nutsedge (*Cyperus rotundus*) and 60 to 66% control of yellow nutsedge (Norsworthy and Meister 2007). Since rimsulfuron is absorbed by both roots and foliage, weeds are controlled by a combination of pre- and postemergence activity. Preliminary tests indicate loblolly pine seedlings have some tolerance to this herbicide (South and Hill 2009).

The preemergence herbicide dimethenamid was tested in pine seedbeds in 2004 and 2005 (South and Hill 2005; 2006) and on container stock in 2008 (Jackson et al. 2009). The herbicide (Tower®) is sold by BASF and is now registered for use in conifer nurseries. Dimethenamid controls grasses and has activity on some small-seeded broadleaves such as spotted spurge (Chamaesyce maculata). This herbicide also has some suppressive activity on yellow nutsedge (Cyperus esculentus) although control at one nursery in Ohio was poor (Mathers et al. 2009).

METHODOLOGY

Four separate studies were installed during the 2009 growing season. At the Trenton Nursery (SC), loblolly pine seed were sown on April 10 and the seedlings were treated on July 1 (12 weeks after sowing). Agrilock was used to stabilize beds after sowing. At the Elberta Nursery (AL), loblolly pine seeds were sown on April 28 and beds were treated with Agrilock (followed soon by a heavy

pine seeds were sown on April 28 and beds were treated with Agrilock (followed soon by a heavy rain). Seedlings were treated on June 16 (7 weeks after sowing). At the Glennville Nursery (GA), loblolly pine seed were sown on May 8 and the seedlings were treated on June 18 (6 weeks after sowing). Agrilock was used to stabilize beds after sowing.

Each study was a randomized complete block design with five replications. Plot size was 10-feet long and one nursery bed wide. Each study involved five herbicide treatments plus an untreated control. Herbicides were applied using a CO_2-backpack sprayer calibrated to apply 22 gallons per acre (as a broadcast application). Dimethenamid (6 EC) was applied at 21 and 42 oz a.i./acre and rimsulfuron (25% DF) was applied at 0.25 and 0.5 oz a.i./acre (with a surfactant: Biosurf 80 plus 0.25%).

Seedling densities (i.e. number of seedlings per square meter) were recorded in the fall using a 1' x 4' counting frame. Seedling samples were hand-lifted from the center of each plot and were transported to Auburn for analysis. Heights and root-collar diameters were measured on 25 seedlings per plot. Oven-dry weights of shoots and roots were recorded for each 25-seedling sample. Data were subjected to ANOVA and treatment effects were compared using contrast statements.

RESULTS

Soil texture at the nurseries (Table 1) ranged from a sandy loam to a loam (Delano Nursery). Rimsulfuron stunted shoots (shoot mass) at Trenton (Table 2, 3) and Glennville (Table 4, 5) but not at Elberta (Table 6, 7) or Delano (Table 8, 9).

At the Glennville Nursery, rimsulfuron increased stand density (Table 4) and did not stunt seedlings. In contrast, dimethenamid had no effect on seedling numbers but did reduce height growth.

At the Elberta Nursery, dimethenamid reduced both stand density and root mass (Table 7, 8). At the Delano Nursery, seedling density was greatest in non-treated plots. However, the 23% reduction in seedling numbers was not statistically significant due to low power (due to much variation among plots).

At the Trenton nursery, rimsulfuron did not appear to injure loblolly pine in 2008 (South and Hill 2009) but root-collar diameter and shoot mass were reduced in 2009. At the Delano Nursery, this herbicide had no statistical effect on seedling size or numbers in either year.

MANAGEMENT IMPLICATIONS

Preliminary results suggest that, depending upon nursery and year, the production of loblolly pine seedlings can be affected by either dimethenamid or rimsulfuron. Managers wishing to try Tower® on young pine seedlings should do so on small plots over a number of different genotypes. Effective weed control will be much easier when nutsedge is controlled with effective herbicides in fallow or cover-crop areas.

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Table 1. Soil texture, organic matter (OM) and soil acidity of the loblolly pine nurseries.

Nursery	Texture	Sand	Silt	Clay	OM	pH
		----------(%)----------				
Elberta, AL	sandy loam	77	10	13	1.1	6.3
Glenville, GA	sandy loam	84	6	10	1.3	5.2
Trenton, SC	sandy loam	76	14	10	1.7	5.4
Delano, TN	loam	48	29	23	2.4	4.9

Table 2. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Trenton Nursery.

Source	df	Density	RCD	Height	Shoot	Root
		------ Probability of a greater F-value ----------				
Replication	4	0.5598	0.0389	0.0705	0.0243	0.1931
Treatment	4	0.8952	0.0095	0.1654	0.0225	0.4122
dimethenamid vs. control	(1)	0.8535	0.2125	0.2912	0.2517	0.5335
rimsulfuron vs. control	(1)	0.5406	0.0032	0.0701	0.0064	0.1842
dimethenamid - linear	(1)	0.9151	0.0441	0.0784	0.0602	0.2324
rimsulfosulfron - linear	(1)	0.6201	0.0234	0.1539	0.0234	0.3481
Error	16					

Table 3. Morphological characteristics for loblolly pine seedlings lifted on October 19 at the Trenton Nursery.

Treatment	Rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	96	4.9	23.0	4.04	0.85
dimethenamid	1x	93	4.9	23.0	4.02	0.86
dimethenamid	2x	95	4.4	20.1	3.26	0.74
rimsulfuron	1x	105	4.2	20.1	2.92	0.72
rimsulfuron	2x	104	4.4	20.7	3.07	0.76
(LSD)		*31.6*	*0.44*	*3.27*	*0.81*	*0.19*

Table 4. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Glennville Nursery.

Source	df	Density	RCD	Height	Shoot	Root
		------ Probability of a greater F-value ----------				
Replication	4	0.2101	0.3055	0.0408	0.4241	0.0140
Treatment	4	0.0405	0.3910	0.0613	0.0674	0.1840
dimethenamid vs. control	(1)	0.4137	0.9048	0.0389	0.0429	0.1097
rimsulfuron vs. control	(1)	0.0074	0.7336	0.1103	0.2857	0.7261
dimethenamid - linear	(1)	0.7095	0.3118	0.0060	0.0072	0.0550
rimsulfosulfron - linear	(1)	0.0327	0.9519	0.1154	0.4998	0.7381
Error	16					

Table 5. Morphological characteristics for loblolly pine seedlings lifted on October 12 at the Glennville Nursery.

Treatment	Rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	139	4.5	29.3	3.39	0.73
dimethenamid	1x	148	4.7	28.6	3.25	0.69
dimethenamid	2x	142	4.1	26.4	2.83	0.63
rimsulfuron	1x	164	4.7	28.2	3.17	0.68
rimsulfuron	2x	159	4.5	27.8	3.26	0.75
(LSD)		*28.1*	*0.69*	*1.94*	*0.38*	*0.167*

Table 6. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Elberta Nursery.

Source	df	Density	RCD	Height	Shoot	Root
		------ Probability of a greater F-value ----------				
Replication	4	0.3151	0.2264	0.0408	0.0657	0.5223
Treatment	4	0.1437	0.5045	0.0613	0.8012	0.1165
dimethenamid vs. control	(1)	0.0316	0.1334	0.4398	0.8878	0.0157
rimsulfuron vs. control	(1)	0.2146	0.5090	0.4838	0.3812	0.2195
dimethenamid - linear	(1)	0.0220	0.2694	0.7643	0.9746	0.0132
rimsulfosulfron - linear	(1)	0.5918	0.3603	0.9829	0.2995	0.3816
Error	16					

Table 7. Morphological characteristics for loblolly pine seedlings lifted on January 13 at the Elberta Nursery.

Treatment	Rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	143	5.3	29.5	3.39	0.73
dimethenamid	1x	126	5.5	29.9	3.25	0.69
dimethenamid	2x	115	5.8	29.6	2.83	0.63
rimsulfuron	1x	124	5.5	29.0	3.17	0.68
rimsulfuron	2x	137	5.4	29.5	3.26	0.75
(LSD)		*22.9*	*0.42*	*0.78*	*0.38*	*0.167*

Table 8. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Delano Nursery.

Source	df	Density	RCD	Height	Shoot	Root
		------ Probability of a greater F-value ----------				
Replication	4	0.3960	0.0844	0.3404	0.0302	0.8937
Treatment	4	0.5313	0.5982	0.2700	0.6465	0.5853
dimethenamid vs. control	(1)	0.1150	0.6211	0.2015	0.7996	0.8130
rimsulfuron vs. control	(1)	0.1479	0.2957	0.7583	0.6599	0.3977
dimethenamid - linear	(1)	0.1151	0.3263	0.3325	0.6901	0.9253
rimsulfosulfron - linear	(1)	0.2040	0.2527	0.4192	0.5547	0.2736
Error	16					

Table 9. Morphological characteristics for loblolly pine seedlings lifted on November 19 at the Delano Nursery.

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	260	4.9	27.6	4.58	0.74
dimethenamid	1x	216	4.9	28.5	4.86	0.77
dimethenamid	2x	200	4.7	28.3	4.45	0.73
rimsulfuron	1x	213	4.7	27.8	4.53	0.71
rimsulfuron	2x	213	4.7	26.9	4.39	0.66
(LSD)		*76.6*	*0.39*	*1.60*	*0.68*	*0.14*