RESEARCH REPORT 06-03

SHIELDED APPLICATIONS OF SULFONYLUREA HERBICIDES IN LOBLOLLY PINE SEEDBEDS: Part II

by
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INTRODUCTION

Several nursery managers have fabricated shielded herbicide applicators for applying glyphosate in-between pine drills. This method of herbicide application can reduce the risk associated with herbicide injury. Most directed applicators are used to apply glyphosate in-between drill rows of hardwoods (sometimes having 4 drills per bed). Some spray oxyfluorfen (GoalTender®) under the canopy of hardwoods. In some cases, directed applications are made in 8-drill pine seedbeds.

The herbicides metsulfuron-methyl (Escort® or Ally®) and halosulfuron-methyl (Sedgehammer®) are classified as sulfonylurea herbicides. Metsulfuron-methyl has activity on spurge (*Euphobia* spp.) while halosulfuron-methyl has activity on nutsedge (*Cyperus* spp.). The Cooperative has tested broadcast applications of these herbicides (Carey and South 1998; South and Hill 2001; VanderSchaaf et al. 2002) and in 2004, directed applications were evaluated (South and Hill 2005). Trials with the directed method of herbicide application were repeated in 2005 on *Pinus taeda* seedlings.

METHODOLOGY

Two studies were installed during the 2005 growing season. At the Shubuta Nursery, loblolly pine seeds were sown on April 27 and the seedlings were treated on June 8 (6 weeks after sowing). At the Elberta Nursery, loblolly pine seeds were sown on May 13 and the seedlings were treated on August 17 (14 weeks after sowing). Agrilock was used to stabilize beds at both nurseries. No mulch was used at Elberta while pine bark was applied at Shubuta.

Each study was a randomized complete block design with five replications. Plot size was 10-feet long and one bed wide. Each study involved five herbicide treatments plus an untreated control. Herbicides were applied using a CO_2-backpack sprayer calibrated to apply either 22 gallons per acre (as a broadcast application) or 32.5 gallons per acre (as a directed application). The amount of herbicide applied was the same per acre (i.e. herbicide cost per bed is the same for both methods). However, the rate applied in the 2-inch band is 3 times higher than the rate applied in a 6-inch broadcast band (since 4 inches out of every 6 inches are not treated).

The low rate (1X) of halosulfuron was 15 g a.i./acre and for metsulfuron the 1X rate was 2.55 g

a.i./ha. The broadcast herbicide rate (2X) was 30 g a.i/acre of halosulfuron and 5.1 g a.i./acre for metsulfuron. Only one treatment included a surfactant (0.5% V/V). Seedling densities (i.e. number of seedlings per square foot) were recorded in November and December 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. Treatment effects were compared using orthogonal contrasts.

RESULTS

Soil texture at the Elberta Nursery is classified as a loamy sand with an organic matter content of 1.1% (Table 1). At this nursery, both sulfonylurea herbicides stunted height growth (Table 2) but RCD and dry weights were not affected. For halosulfuron-methyl, the directed spray treatment was not different from the broadcast treatment. For metsulfuron-methyl, there was a trend of increased tolerance with the directed application.

In contrast, halosulfuron-methyl treatments had no detectable negative effect on seedlings at the sandier Shubuta Nursery (Table 3). However, method of application apparently had a significant effect on RCD when seedlings were treated with metsulfuron-methyl. Therefore, at both nurseries, tolerance was increased when metsulfuron-methyl (2X) was applied as a directed spray (Tables 4 and 5).

Results reported here are similar to those reported for tests conducted in 2004 (South and Hill 2005). Pine bark was used at the Shubuta Nursery and the statistical tests did not detect any significant treatment effect for either year. At the Elberta Nursery (where no mulch was applied), broadcast treatments stunted height growth in both years. At this nursery, pine tolerance to metsulfuron-methyl was increased by the directed application.

MANAGEMENT IMPLICATIONS

Directed applications can reduce seedling injury when applying non-selective herbicides like glyphosate. Directed applications can also reduce the potential for stunting of loblolly pine when treating with metsulfuron-methyl. However, applying halosulfuron-methyl as a directed application does not appear to eliminate stunting on nursery soils where herbicide is applied directly to the soil.

It is important to not increase injury by increasing the dose rate in the drill. To avoid seedling injury, nursery managers who manage sandy soils (with no mulch and with low organic matter content) should realize that some herbicides will likely stunt seedlings, even when directed between the drills.

REFERENCES

Carey, W.A. and D.B. South. 1998. Comparison of fumigants and herbicides for the control of

purple nutsedge at the Flint River Nursery. Research Report 98-7. 5 p.

South, D.B. and T. Hill. 2001. Preliminary trials with metsulfuron-methyl. Auburn University Southern Forest Nursery Management Cooperative. Research Report 01-08. 4 p.

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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	loamy sand	80	13	7	1.1	5.2
Shubuta	sandy loam	77	17	6	1.7	5.0

Table 2. Analysis of variance for loblolly pine seedlings as affected by herbicides at the Elberta Nursery in 2005.

Source	df	Density	Height	RCD	Root	Shoot
		---------- Probability of a greater F-value ----------				
Replication	4	0.0063	0.0001	0.4777	0.0001	0.0001
Treatment	7	0.6707	0.0043	0.5337	0.5994	0.4244
herbicide effect	(1)	0.5965	0.0041	0.6690	0.3487	0.4245
halosulfuron effect	(1)	0.6042	0.0124	0.7998	0.6535	0.2981
metsulfuron effect	(1)	0.4756	0.0055	0.4374	0.1477	0.4239
halo-directed effect	(1)	0.6932	0.7424	0.4165	0.8471	0.8401
met-directed effect	(1)	0.5120	0.0600	0.0807	0.2416	0.1176
Error	28					

Table 3. Analysis of variance for loblolly pine seedlings as affected by herbicides at the Shubuta Nursery in 2005.

Source	df	Density	Height	RCD	Root	Shoot
		---------- Probability of a greater F-value ----------				
Replication	4	0.0042	0.0073	0.1155	0.3246	0.0810
Treatment	7	0.8288	0.3250	0.0983	0.6913	0.1106
herbicide effect	(1)	0.7092	0.6700	0.4514	0.9717	0.7511
halosulfuron effect	(1)	0.7882	0.6305	0.5792	0.8736	0.4597
metsulfuron effect	(1)	0.6150	0.7535	0.6209	0.9803	0.8299
halo-directed effect	(1)	0.8050	0.3861	0.8615	0.3770	0.5751
met-directed effect	(1)	0.3274	0.7453	0.0336	0.6613	0.1213
Error	28					

Table 4. Morphological characteristics for loblolly pine seedlings lifted in November 2005 at the Elberta Nursery.

Treatment	Density (#/m2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	168	4.6	27.5	8.06	1.39
Halosulfuron					
Directed 2X	166	4.6	26.4	8.02	1.45
Directed 1X +surfactant	169	4.6	27.3	7.40	1.45
Directed 1X	154	4.6	25.6	7.50	1.42
Broadcast 2X	171	4.5	26.2	7.62	1.43
Metsulfuron					
Directed 2X	153	4.7	26.6	8.19	1.58
Directed 1X	170	4.7	26.7	8.20	1.58
Broadcast 2X	161	4.5	25.6	7.40	1.44
(LSD)	*24.9*	*0.25*	*1.04*	*1.00*	*0.23*

Table 5. Morphological characteristics for loblolly pine seedlings lifted in December 2005 at the Shubuta Nursery.

Treatment	Density (#/m2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	273	4.1	30.9	2.73	0.38
Halosulfuron					
Directed 2X	275	4.0	29.9	2.61	0.35
Directed 1X +surfactant	274	4.1	30.3	2.89	0.40
Directed 1X	276	4.2	30.3	2.97	0.39
Broadcast 2X	274	4.0	29.5	2.62	0.39
Metsulfuron					
Directed 2X	270	4.2	30.4	2.94	0.40
Directed 1X	281	4.0	30.6	2.63	0.36
Broadcast 2X	277	4.0	30.3	2.69	0.39
(LSD)	*13.3*	*0.18*	*0.95*	*0.32*	*0.06*