Auburn University
Southern Forest Nursery Management Cooperative

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

by
David B. South and Tommy Hill

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 6- or 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). In 2004, 2005, and 2006, directed applications were evaluated (South and Hill 2005; 2006; 2007). Trials with the directed method of herbicide application were continued in 2007.

Pelargonic acid (Scythe®) is a fatty acid that, when applied as an herbicide, has non-selective activity on weeds. It will suppress many small annual broadleaves and grasses (less than 6" in height). The acid breaks down the epicuticular wax resulting in rapid desiccation, usually within hours of application. For certain weeds, 5.7 l/ha of pelargonic acid will provide better control of trumpetcreeper (*Campis radicans*) than 1.2 l/ha of glyphosate (Chachalis and Reddy 2004).

METHODOLOGY

Two studies were installed during the 2007 growing season. At the Camden Nursery (AL), loblolly pine seeds were sown on April 26 and the seedlings were treated on June 27 (9 weeks after sowing). At the Elberta Nursery (AL), slash pine seeds were sown on April 26 and the seedlings were treated on June 27 (9 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 bed wide. Each study involved seven 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./acre. The broadcast herbicide rate (2X) was 30 g a.i/acre of halosulfuron and 5.1 g a.i./acre for metsulfuron. The pelargonic acid treatments were applied as a broadcast (3.7 pounds and 7.4 pounds a.i/acre) or directed (7.5 pounds a.i./acre).

Seedling densities (i.e. number of seedlings per square meter) were recorded in October 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. Data were subjected to ANOVA and treatment effects were compared using contrast statements.

RESULTS

Soil texture at the Elberta Nursery was classified as a sand while the soil at Camden Nursery was a loamy sand (Table 1). At the Camden Nursery none of the treatments were significantly different from untreated seedlings in regards to stocking or shoot weight (Table 2). No reduction in seedling morphology was detected when seedlings were treated with either pelargonic acid or metsulfuron methyl. However, seedlings that were treated with halosulfuron-methyl were stunted, had fewer roots, and had a smaller root-collar diameter (Table 3). Although applying this herbicide as a directed spray tended to protect the roots from injury, the weight was still numerically less than for untreated seedlings.

At the Elberta Nursery, none of the treatments were significantly different from untreated seedlings in regards to stocking, height or root weight (Table 3). However, phytotoxicity was noticed when pelargonic acid was applied to foliage (Table 4). Shoot growth was stunted when the high rate (2x) was applied as a broadcast spray ($P = 0.068$). No injury was detected when the herbicide was applied as a directed spray (Table 5).

MANAGEMENT IMPLICATIONS

Spurge is a troublesome weed in pine nurseries. This weed is susceptible to low rates of metsulfuron-methyl applied as either a directed or broadcast spray. In some nurseries, a directed application of metsulfuron-methyl will increase pine tolerance but the increase is not as great as when applying a contact herbicide. Pelargonic acid has contact activity on spurge and the desiccation effect can be observed soon after treatment (Figure 1). Although loblolly pine has some tolerance to a broadcast application of pelargonic acid, a directed application can reduce the risk of foliar injury. At present, the application cost of a broadcast application of metsulfuron-methyl is lower than a directed application of pelargonic acid. Currently, one supplemental label for Escort® allows the use in alleyways while Scythe® may be applied as a directed spray around nursery trees.

REFERENCES

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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
		----------(%)----------				
Camden	sandy loam	61	26	13	1.7	5.0
Elberta	sand	90	8	2	1.0	5.2

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

Source	df	Density	RCD	Height	Shoot	Root
		------ Probability of a greater F-value ----------				
Replication	4	0.0675	0.0001	0.0001	0.0010	0.0001
Treatment	7	0.8666	0.0199	0.0017	0.1910	0.0034
Pelargonic low vs high	(1)	0.8909	0.9006	0.4848	0.2889	0.7348
Pelargonic vs control	(1)	0.7743	0.8352	0.4271	0.5932	0.5840
Halosulfuron vs control	(1)	0.9526	0.0383	0.0067	0.3066	0.0030
Metsulfuron vs control	(1)	0.5939	0.2494	0.2282	0.2705	0.7417
Pelargonic application	(1)	0.3670	0.5976	0.1031	0.8584	0.6618
Halosulfuron application	(1)	0.3760	0.8554	0.7297	0.2194	0.0512
Metsulfuron application	(1)	0.7319	0.1126	0.1797	0.6074	0.3924
Error	28					

Table 3. Morphological characteristics for loblolly pine seedlings lifted on September 26 at the Camden Nursery. H = halosulfuron; M = metsulfuron; P = pelargonic acid

Treatment	rate g a.i./ha	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	274	3.1 a	25.1 ab	1.47 ab	0.20 ab
P broadcast	1x	266	3.1 ab	24.5 bc	1.65 a	0.20 ab
P broadcast	2x	264	3.1 ab	24.5 bc	1.47 ab	0.19 ab
P directed	2x	280	3.2 ab	25.2 ab	1.50 ab	0.18 ab
H directed	2x	284	2.9 b	22.9 c	1.42 ab	0.16 ab
H broadcast	2x	267	2.9 b	23.2 c	1.22 b	0.12 c
M directed	2x	286	3.2 ab	25.4 ab	1.59 ab	0.20 bc
M broadcast	2x	280	3.4 a	26.5 a	1.67 a	0.22 a
(LSD)		*38.2*	*0.27*	*1.64*	*0.338*	*0.042*

Table 4. 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	0.0058	0.0081	0.0045	0.4039	0.0601
Treatment	7	0.2990	0.5327	0.3904	0.3624	0.1881
Pelargonic low vs high	(1)	0.0201	0.8091	0.0998	0.4447	0.3835
Pelargonic vs control	(1)	0.4910	0.4543	0.2101	0.0680	0.4435
Halosulfuron vs control	(1)	0.3367	0.1185	0.1459	0.4311	0.2528
Metsulfuron vs control	(1)	0.7446	0.7218	0.4484	0.8358	0.7044
Pelargonic application	(1)	0.2274	0.8625	0.7129	0.6055	0.4900
Halosulfuron application	(1)	0.2492	0.8117	0.2269	0.7673	0.1624
Metsulfuron application	(1)	0.5116	0.1253	0.4453	0.7756	0.0634
Error	28					

Table 5. Morphological characteristics for loblolly pine seedlings lifted on October 11 at the Elberta Nursery. H = halosulfuron; M = metsulfuron; P = pelargonic acid

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	204 ab	4.0	28.6	2.78	0.32 ab
P broadcast	1x	224 a	4.0	27.6	2.37	0.33 ab
P broadcast	2x	196 b	3.9	28.5	2.51	0.30 ab
P directed	2x	210 ab	3.9	28.3	2.61	0.28 ab
H directed	2x	219 ab	3.8	27.7	2.66	0.32 ab
H broadcast	2x	207 ab	3.8	28.3	2.70	0.28 ab
M directed	2x	211 ab	4.1	28.1	2.77	0.34 a
M broadcast	2x	203 ab	3.9	28.5	2.68	0.27 b
(LSD)		*23.6*	*0.27*	*1.08*	*0.38*	*0.06*

Figure 1. The effect of a broadcast application of pelargonic acid at the Elberta Nursery resulted in a slight reduction in shoot weight (P=0.068) and good control of prostrate spurge.