Auburn University Southern Forest Nursery Management Cooperative

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SHIELDED APPLICATIONS OF SULFONYLUREA HERBICIDES IN LOBLOLLY PINE SEEDBEDS

by
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INTRODUCTION

Several nursery managers have fabricated shielded herbicide applicators for applying glyphosate in between seedling 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). In some cases, applications are made in 8-drill pine seedbeds.

The herbicides metsulfuron-methyl (Escort® or Ally®) and halosulfuron-methyl (Manage®) are classified as sulfonylurea herbicides. To date, the Cooperative has tested only broadcast applications of these herbicides in pine nurseries (Carey and South 1998; South and Hill 2001; VanderSchaaf et al. 2002). Metsulfuron-methyl has activity on spurge (*Euphobia* spp.) while halosulfuron-methyl has activity on nutsedge (*Cyperus* spp.). Use of shielded herbicide sprayers might increase tolerance of pines to sulfonylurea herbicides.

Trials with the directed method of herbicide application were conducted in 2004 on *Pinus taeda* and *Pinus elliottii*. The rates tested were high enough for broadcast applications to inhibit pine height growth.

METHODOLOGY

Three studies were installed during the 2004 growing season. At the Shubuta Nursery, loblolly pine seeds were sown on April 15 and the seedlings were treated on June 8 (8 weeks after sowing). At the Elberta Nursery, loblolly pine seeds were sown on April 18 and the seedlings were treated on June 23 (9 weeks after sowing). A third study was installed at the Atmore Nursery on slash pine beds.

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 3X higher than the rate applied in a 6 inch broadcast band (since 4 inches out of every 6 inches are not treated).

The broadcast herbicide rate was 30 g a.i./acre of halosulfuron and 5.1 g a.i./acre for metsulfuron. 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. The study at the Atmore nursery was operationally lifted by mistake and therefore no results from this test are available.

RESULTS

Soil texture at the Elberta Nursery is classified as a loamy sand with an organic matter content of 0.1% (Table 1). At this nursery, both sulfonylurea herbicides stunted shoot growth (Table 2). In contrast, treatments had no significant effect on seedlings at the sandier Shubuta Nursery (Table 3). The method of herbicide application affected height growth at the Elberta Nursery but the results varied with herbicide. Stunting with metsulfuron-methyl was reduced with directed applications (Table 4). In contrast, stunting with halosulfuron-methyl was increased with directed applications. Seedlings treated with the metsulfuron-methyl at the Shubuta Nursery were also on average taller than seedlings treated with a broadcast application (Table 5) but the difference was not statistically significant.

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	86	10	4	1.0	5.6
Shubuta	sand	95	4	1	0.9	4.5

Table 2. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Elberta Nursery in 2004.

Source	df	Density	RCD	Height	Root	Shoot
		---------- Probability of a greater F-value ----------				
Replication	4	0.2572	0.7000	0.0908	0.3861	0.8917
Treatment	5	0.2515	0.2704	0.0024	0.8494	0.0221
halosulfuron effect	(1)	0.3914	0.3796	0.0123	0.5875	0.0768
metsulfuron effect	(1)	0.0799	0.1327	0.0023	0.5223	0.0084
halo-directed effect	(1)	0.5013	0.3654	0.0260	0.6080	0.1697
met-directed effect	(1)	0.1021	0.8621	0.0201	0.3394	0.1048
Error	20					

Table 3. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Shubuta Nursery in 2004.

Source	df	Density	RCD	Height	Root	Shoot
		---------- Probability of a greater F-value ----------				
Replication	4	0.0508	0.5731	0.8333	0.8915	0.9311
Treatment	5	0.7389	0.9111	0.5347	0.8216	0.5989
halosulfuron effect	(1)	0.3193	0.6388	0.2107	0.3437	0.5069
metsulfuron effect	(1)	0.3168	0.5379	0.4075	0.9985	0.4871
halo-directed effect	(1)	0.3017	0.7032	0.4988	0.6865	0.2396
met-directed effect	(1)	0.5479	0.9866	0.1705	0.8398	0.2128
Error	20					

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

Treatment	Density (#/m2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	65	5.0	33.0	4.96	0.74
Halosulfuron					
Directed	59	5.0	30.5	4.14	0.74
Directed+surfactant	64	4.7	30.3	3.71	0.68
Broadcast	62	4.9	32.6	4.82	0.70
Metsulfuron					
Directed	61	4.8	31.5	4.15	0.66
Broadcast	55	4.8	29.4	3.33	0.73
(LSD)	*9.1*	*0.32*	*1.79*	*1.00*	*0.15*

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

Treatment	Density (#/m2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	112	3.4	27.5	2.38	0.29
Halosulfuron					
Directed	102	3.4	26.0	2.14	0.26
Directed+surfactant	106	3.3	26.1	2.24	0.27
Broadcast	110	3.4	26.7	2.41	0.27
Metsulfuron					
Directed	108	3.3	27.5	2.39	0.28
Broadcast	104	3.3	25.8	2.10	0.29
(LSD)	*15.2*	*0.37*	*2.4*	*0.47*	*0.12*

MANAGEMENT IMPLICATIONS

Directed applications can reduce seedling injury when applying contact herbicides like oxyfluorfen or with systemic herbicides like glyphosate. Directed applications might also reduce the stunting effects of soil active/foliar active herbicides like metsulfuron-methyl. However, care must be exercised when applying certain types of soil active herbicides.

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 low organic matter content) should take precautions to ensure that the application method does not result in reducing herbicide tolerance.

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.