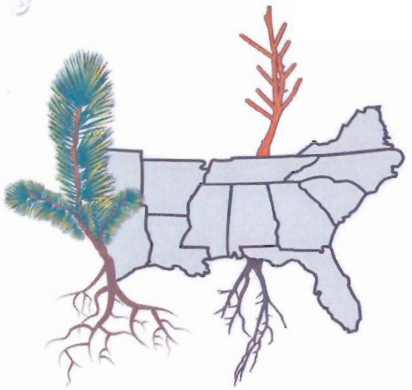

Auburn University
Southern Forest Nursery
Management Cooperative

RESEARCH REPORT 09-03

BROADCAST APPLICATIONS OF METSULFURON-METHYL ON YOUNG LOBLOLLY PINE SEEDLINGS

by
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INTRODUCTION

Spurge (*Chamaesyce maculate*) is a troublesome weed in southern pine nurseries and, under some conditions, can stunt seedling growth (South and Hill 2008). The herbicides metsulfuron-methyl (sold under various trade names) is classified as a sulfonylurea herbicide. Metsulfuron-methyl has activity on spurge (Euphobia spp.) and the Nursery Cooperative has tested broadcast applications for a number of years (Carey and South 1998; South and Hill 2001; VanderSchaaf et al. 2002). In 2004, 2005, and 2006, directed applications were tried in hopes of improving selectivity (South and Hill 2005; 2006; 2007). However, these trials were discontinued since tolerance was typically the same as the broadcast applications. In 2008, testing of metsulfuron-methyl was conducted at four nurseries using a lower rate of 0.15 ounce of product per acre. The objective of this study was to determine if this multiple herbicide applications could be applied at loblolly pine nurseries for the control of spurge.

METHODOLOGY

Four studies were installed during the 2008 growing season. Plot size was one seedling bed wide (4 ft) and 10-feet long. Metsulfuron-methyl (Escort XL®) was applied either once (e.g. May) or twice (May and again in June). Each of the seven treatments were replicated five times and were applied using a CO_2-backpack sprayer calibrated to apply 22 gallons per acre. The rate applied for each application was 0.09 oz a.i./acre/application). A fifth study (only two replications) was also installed

at the Trenton Nursery in South Carolina where four higher rates (0.3 to 0.8 oz product/acre) of metsulfuron were applied in May.

Seedling densities (i.e. number of seedlings per square meter) were recorded using a 1'x 4' counting frame. Seedling samples were hand-lifted from the center of each plot and transported to Auburn for analysis. Seeding height and root-collar diameter were measured on 25 seedlings per plot and then oven-dry weights of shoots and roots were recorded. Data were subjected to ANOVA and treatment effects were compared using orthogonal contrasts.

RESULTS

Soil texture at the Camden Nursery was classified a sandy loam with about 17% clay while soils at the Trenton and Jesup Nurseries contained less than 10% clay (Table 1). Seed were sown in April and at three nurseries, the first application of metsulfuron was applied in May. At the Elberta Nursery, the first application of metsulfuron was made in mid-July (Table 2).

A single application of metsulfuron reduced seedling height and stocking levels at the Camden Nursery (Table 3-4). Both the May application and the June application killed seedlings. Height growth was also reduced slightly at the Elberta Nursery (Table 5-6) and seedlings were killed at both the Jesup Nursery (Table 7-8) and at the Trenton Nursery (Table 9-12). In general, 2008 produced more seedling mortality from metsulfuron than in previous years' trials. The additional seedling mortality might be explained by smaller seedlings at time of the May application. Seedlings treated in July 2008 (Elberta Nursery) did not show a significant reduction in stand density.

MANAGEMENT IMPLICATIONS

These findings indicate that when a 0.09 oz a.i./a rate is applied to loblolly pine seedlings in May, mortality could occur at 2 out of 4 nurseries. When seedlings are sown in April, tolerance might be increased by waiting until July before applying metsulfuron.

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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, AL	sandy loam	66	17	17	1.0	4.9
Elberta, AL	sandy loam	72	14	14	1.5	5.2
Jesup, GA	sandy loam	77	15	8	2.3	5.2
Trenton, SC	loamy sand	80	11	9	1.5	5.1

Table2. Sowing date, mulch type, application dates and lifting dates for studies in 2008.

Nursery	Sow date	Mulch	First	Second	Lift date
Pine Hill	4/24	Agrilock	5/22	6/19	9/23
Elberta	4/30	Agrilock	7/16	8/13	11/22
Jesup	4/19	Agrilock+bark	5/28	7/1	11/18
Trenton	4/16	Agrilock	5/19	6/24	10/15

Table 3. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Pine Hill Nursery.

Source	df	Density	RCD	Height	Root	Shoot
		----------Probability of a greater F-value----------				
Replication	4	0.0452	0.8078	0.0352	0.1127	0.2881
Treatment	6	0.2468	0.0112	0.0003	0.0917	0.0265
Control vs. 1 application	(1)	0.3099	0.5897	0.0736	0.2023	0.5352
Control vs. 2 applications	(1)	0.0166	0.7581	0.0162	0.1203	0.8580
Error	24					

Table 4. Morphological characteristics for loblolly pine seedlings at the Pine Hill Nursery.

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Root (g)	Shoot (g)
Control	0	218	2.8	19.9	0.159	1.28
Metsulfuron	0.15	202	2.7	17.4	0.133	1.35
Metsulfuron	0.15+0.15	177	2.7	16.5	0.127	1.27
(LSD)		*33.1*	*0.28*	*2.73*	*0.034*	*0.30*

Table 5. 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	0.3857	0.3085	0.2072	0.6233	0.1749
Treatment	6	0.9340	0.2312	0.3417	0.4884	0.6325
Control vs. 1 application	(1)	0.8371	0.6402	0.0308	0.6380	0.6380
Control vs. 2 applications	(1)	0.6224	0.1466	0.4287	0.1252	0.1252
Control vs. metsulfuron	(1)	0.9481	0.5872	0.0421	0.2056	0.9029
Error	24					

Table 6. Morphological characteristics for loblolly pine seedlings at the Elberta Nursery.

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	181	4.6	28.8	3.89	0.37
Metsulfuron	0.15	178	4.5	27.3	3.77	0.38
Metsulfuron	0.15+0.15	174	4.8	28.3	3.47	0.35
(LSD)		*26.7*	*0.29*	*1.37*	*0.55*	*0.056*

Table 7. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Jesup Nursery.

Source	df	Density	RCD	Height	Shoot	Root
		---------- Probability of a greater F-value ----------				
Replication	4	0.2827	0.0079	0.0427	0.0339	0.1549
Treatment	6	0.0018	0.2154	0.0617	0.8531	0.4486
Control vs. 1 application	(1)	0.0543	0.8413	0.8794	0.9628	0.4584
Control vs. 2 applications	(1)	0.0016	0.1380	0.1892	0.6023	0.1889
Control vs. metsulfuron	(1)	0.0037	0.3536	0.3990	0.7836	0.2359
Error	22					

Table 8. Morphological characteristics for loblolly pine seedlings at the Jesup Nursery.

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	198	4.9	29.1	3.99	0.75
Metsulfuron	0.15	179	4.8	28.8	4.00	0.80
Metsulfuron	0.15+0.15	165	4.6	26.7	3.83	0.84
(LSD)		*19.6*	*0.39*	*3.92*	*0.63*	*0.14*

Table 9. 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	1	0.0143	0.0238	0.0095	0.2532	0.0852
Treatment	7	0.0603	0.0001	0.0315	0.1519	0.0104
Control vs. 1 application	(1)	0.1871	0.2311	0.5500	0.5654	0.4768
Control vs. 2 applications	(1)	0.0147	0.2259	0.5439	0.7159	0.8026
Control vs. metsulfuron	(1)	0.0912	0.0996	0.9651	0.7387	0.4137
Error	24					

Table 10. Morphological characteristics for loblolly pine seedlings at the Trenton Nursery.

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	168	4.1	20.1	3.07	0.51
Metsulfuron	0.15	151	4.3	20.7	3.22	0.54
Metsulfuron	0.15+0.15	136	4.3	20.7	2.98	0.51
(LSD)		*25.3*	*0.36*	*1.97*	*0.53*	*0.06*

Table 11. Analysis of Variance for metsulfuron applied in May at 3 rates at the Trenton Nursery.

Source	df	Density	RCD	Height	Shoot	Root
		---------- Probability of a greater F-value ----------				
Replication	1	0.8101	0.5008	0.1555	0.7399	0.7399
Treatment	7	0.0442	0.0577	0.2457	0.1857	0.1857
Control vs. 0.3	(1)	1.0000	0.0894	0.9607	0.5367	0.5807
Control vs. 0.4	(1)	0.0649	0.0362	0.6322	0.6055	0.0713
Control vs. 0.5	(1)	0.0484	0.1750	0.5239	0.7135	0.6747
Control vs. 0.6	(1)	0.1556	0.0313	0.1115	0.0460	0.0631
Error	7					

Table 12. Morphological characteristics loblolly pine seedlings at the rate study at the Trenton Nursery.

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control	0	144	4.6	26.0	3.72	0.58
metsulfuron	0.3	144	4.1	21.6	3.48	0.54
metsulfuron	0.4	114	4.0	23.7	3.52	0.44
metsulfuron	0.5	112	4.2	22.0	3.58	0.62
metsulfuron	0.8	132	3.9	22.6	2.83	0.43
(LSD)		*31.9*	*0.55*	*4.44*	*0.87*	*0.17*