Auburn University Southern Forest Nursery Management Cooperative

RESEARCH REPORT 02-5

TRIALS WITH METSULFURON-METHYL ON LOBLOLLY AND SLASH PINE

by
Curtis VanderSchaaf, David B. South, and Tommy Hill

INTRODUCTION

The herbicide metsulfuron-methyl (Escort®) is registered for use in a variety of sites from pine plantations to outplanted yellow-poplar seedlings to industrial turf. Escort® controls weeds thru blocking an enzyme that plants use to grow cells. The current formulation is a dispersible granule that contains 60% active ingredient. Preliminary tests with metsulfuron-methyl in southeastern US forest tree nurseries were reported in RR 01-8. It was found that seedlings less than 6-weeks old were injured when growing on sandy soils low in organic matter.

In Australia, Dutkowski (1990) found that the addition of a surfactant could increase phytotoxicity to *Pinus radiata* by metsulfuron. Rates of 0.2 to 7.3 g a.i./a applied after sowing did not result in mortality, but the addition of a surfactant (Siloxane) at rates above 4 g a.i./a resulted in death. Metsulfuron was applied to several different conifers in a nursery in New Zealand (Crozier 1990). It was found that complete mortality occurred when a surfactant (Silwet L-77) was used. Therefore, we did not include a surfactant in the herbicide mix. Nine studies were conducted in 2001 to determine if this product causes phytotoxicity in seedlings and whether it provides control of nutsedge and spurge.

METHODOLOGY

Nine experiments were installed at eight nurseries during the 2001 growing season (Table 1). Seven studies were established in loblolly pine seedbeds. Slash pine was treated at the Alabama Forestry Commission Nursery in Atmore and at the Georgia Forestry Commission Nursery in Byromville.

Each study was installed as a randomized complete block design with four replications. Plot size was 10-feet long and one bed wide. Solutions of the dispersible granule were applied using a CO_2-backpack sprayer calibrated to apply 28.4 gallons per acre. Treatments included rates of 0.2 (3.4 g/ai) and 0.4 (6.8 g/ai) ounces of product/acre, and a control at all nurseries. Four nurseries had an extra rate of 0.6 (10.2 g/ai) ounce of product per acre. Seedling densities (i.e. number of seedlings per square foot) were recorded from early-November to late-October using a 1' x 4' counting frame. Seedling samples were hand-lifted from the center of each plot and 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 sample. Additionally, at the Timber Company Nursery in Shubuta, on August 8th (17 weeks after sowing) the number of living spurge (*Euphorbia* spp.) plants were counted in each plot.

RESULTS

In general, loblolly and slash pine appear to be tolerant of metsulfuron-methyl (3.4 to 6.8 g a.i./acre) when applied 9+ weeks after sowing. There was no obvious death of seedlings so seedbed density was not reduced at any nursery. In fact, due to above average weed competition at the Ashburn Nursery, density was increased by herbicide treatment (Table 5). The increases in tree stocking explain the corresponding reductions in RCD and shoot mass at this location. It could also explain the stem elongation which can occur when seedlings are shaded by weeds.

Shoot weights and stem lengths were lower at two other nurseries where differences in stocking were minimal (Tables 3 and 7). However, at the Goldsboro Nursery (Table 7), shoot weights from plots treated with the high rate (10.2 g a.i./acre) were no different than the control.

Root weights were lower only at the Ashburn Nursery (Table 5). No significant effects in total dry weight per square foot were detected at any location.

Based on the results from Byromville, slash pine is less tolerant than loblolly pine (Tables 3 and 4). Differences in soil properties might explain why no stunting of slash pine was observed at the Atmore Nursery. The soil pH and sand content were higher at Byromville.

One common factor at both Goldsboro and Byromville is the high soil pH. It is very likely that injury from metsulfuron-methyl is greater when soil pH is 6.0 or above. This is because the solubility of metsulfuron methyl increases with soil pH (solubility at 25°C is 548 ppm at pH 5 and 2,790 ppm at pH 7).

Metsulfuron-methyl provided excellent control of spurge at the Shubuta Nursery (Table 9). Even the 12 g a.i./acre rate had no surviving spurge plants.

MANAGEMENT IMPLICATIONS

It appears that when soil pH is less than 6.0 and organic matter is greater than 1% loblolly and slash

It appears that when soil pH is less than 6.0 and organic matter is greater than 1% loblolly and slash pine are tolerant to low rates of metsulfuron methyl when treated 9 weeks or more after sowing. Based on the results at Shubuta, this herbicide provides excellent control of prostrate spurge.

REFERENCES

Crozier, E.R. 1990 Chemical control of wilding conifer nurseries. pp. 182-186. In Proceedings of the Forty-Third New Zealand Weed and Pest Control Conference.

Dutkowski, G. 1990. Phytotoxicity of sulphonyl-urea herbicides to radiata pine. pp. 530-534. Proceedings of the 9th Australian Weeds Conference.

Table 1. Soil textures, organic matter and soil acidity levels at eight nurseries.

Nursery	Species	Soil Texture	Sand %	Silt %	Organic Matter %	pH	Sowing date	Treatment date
Atmore	slash	Sandy loam	63	23	0.7	5.9	4/11	7/03
Byromville	slash	Loamy sand	86	7	0.7	6.3	4/23	8/02
Byromville	loblolly	Loamy sand	87	7	0.7	6.0	4/23	8/02
Ashburn	loblolly	Loamy sand	87	8	0.9	5.9	5/03	8/02
Trenton	loblolly	Sand	93	5	1.7	5.5	4/11	7/25
Goldsboro	loblolly	Loamy sand	83	15	0.7	6.0	4/20	7/18
Elberta	loblolly	Loamy sand	81	11	0.4	4.9	5/02	7/02
Shubuta	loblolly	Sand	96	3	0.8	5.2	4/10	6/28

Table 2. Morphological characteristics for slash pine seedlings lifted in October at the Atmore Nursery (seedlings treated in July).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)
0	14.1	4.1	28.6	3.19	0.34	49.7
3.4	14.6	4.3	27.8	3.40	0.38	54.9
6.8	13.6	4.2	28.1	3.41	0.35	51.3
10.2	13.0	4.2	27.9	3.43	0.37	49.0
P > F-value	*0.19*	*0.65*	*0.61*	*0.51*	*0.36*	*0.25*
(LSD)	*1.54*	*0.37*	*1.48*	*0.39*	*0.058*	*6.6*

Table 3. Morphological characteristics for slash pine seedlings lifted in October at the Byromville Nursery (seedlings treated in August).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)
0	18.8	2.9	26.4	1.60	0.22	34.1
3.4	20.2	2.8	24.9	1.37	0.22	32.0
6.8	19.2	3.1	24.9	1.52	0.25	34.3
P > F-value	*0.57*	*0.07*	*0.07*	*0.07*	*0.06*	*0.78*
(LSD)	*3.14*	*0.19*	*1.49*	*0.20*	*0.034*	*8.5*

Table 4. Morphological characteristics for loblolly pine seedlings lifted in October at the Byromville Nursery (seedlings treated in August).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)
0	20.2	3.4	36.9	2.63	0.26	58.5
3.4	19.4	3.5	34.1	2.56	0.30	56.0
6.8	19.7	3.5	35.0	2.56	0.28	55.9
P > F-value	*0.51*	*0.97*	*0.19*	*0.72*	*0.63*	*0.77*
(LSD)	*1.63*	*0.22*	*3.29*	*0.23*	*0.096*	*9.7*

Table 5. Morphological characteristics for loblolly pine seedlings lifted in December at the Ashburn Nursery (seedlings treated in August).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)
0	11.9b	5.0a	23.9a	2.86	1.26	48.9
3.4	12.8b	4.5ab	20.0b	2.03	0.98	39.3
6.8	17.0a	4.3b	20.6b	2.31	0.91	54.7
P > F-value	*0.00*	*0.05*	*0.02*	*0.07*	*0.06*	*0.12*
(LSD)	*2.43*	*0.52*	*2.49*	*0.72*	*0.296*	*15.4*

Table 6. Morphological characteristics for loblolly pine seedlings lifted in November at the Trenton Nursery (seedlings treated in July).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)
0	20.6	4.3	20.2	2.88	0.95	77.9
3.4	19.8	4.4	19.4	3.26	1.10	86.2
6.8	19.1	4.4	18.4	2.95	1.10	76.4
10.2	18.6	4.6	18.4	3.14	1.10	77.5
P > F-value	*0.06*	*0.27*	*0.40*	*0.57*	*0.21*	*0.40*
(LSD)	*1.45*	*0.33*	*2.55*	*0.65*	*0.183*	*13.8*

Table 7. Morphological characteristics for loblolly pine seedlings lifted in November at the Goldsboro Nursery (seedlings treated in July).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)
0	21.1	4.1	28.9a	2.91	0.59	73.6
3.4	23.2	4.0	24.6b	2.60	0.63	75.5
6.8	23.6	4.0	23.9b	2.46	0.65	72.9
10.2	22.9	4.2	24.1b	2.93	0.73	83.6
P > F-value	*0.32*	*0.35*	*0.00*	*0.06*	*0.12*	*0.45*
(LSD)	*3.07*	*0.36*	*1.75*	*0.39*	*0.122*	*16.1*

Table 8. Morphological characteristics for loblolly pine seedlings lifted in October at the Elberta Nursery (seedlings treated in July).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)
0	19.4	3.7	27.0	2.55	0.24	54.2
3.4	17.6	3.7	27.4	2.47	0.26	47.9
6.8	17.4	3.7	26.6	2.65	0.26	50.5
10.2	16.6	3.7	26.6	2.68	0.27	49.3
P > F-value	*0.17*	*0.98*	*0.36*	*0.46*	*0.56*	*0.63*
(LSD)	*2.68*	*0.28*	*0.95*	*0.32*	*0.049*	*10.6*

Table 9. Morphological characteristics for loblolly pine seedlings lifted in November at the Shubuta Nursery (seedlings treated in June).

Metsulfuron-methyl Rate g ai/acre	Density (#/sq ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Total dry weight (g/sq ft)	Number of spurge plants (#/sq ft)
0	24.2	4.7	33.2a	3.32	0.39	89.5	22.2a
3.4	21.5	4.9	30.9b	3.34	0.49	82.1	0.0b
6.8	21.9	4.9	31.0b	3.35	0.47	83.5	0.0b
P > F-value	*0.15*	*0.12*	*0.01*	*0.92*	*0.21*	*0.38*	*0.00*
(LSD)	*3.06*	*0.23*	*1.52*	*0.20*	*0.130*	*12.8*	*7.71*