Auburn University
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# RESEARCH REPORT 01-8

## PRELIMINARY TRIALS WITH METSULFURON METHYL

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**INTRODUCTION**

The herbicide metsulfuron methyl (Escort®) is registered for use in loblolly pine, slash pine and yellow poplar plantations. Often Escort® is included in a tank-mix to increase the spectrum of weed control. When included in a tank-mix, Escort® is applied at rates ranging from 0.33 to 2 ounces of product per acre. This herbicide is also marketed at lower use rates under the name Ally® for control of weeds in fallow areas and on wheat, barley, pastures and rangelands. On fallow land for example, rates of 0.1 ounce of product per acre (1.7 grams a.i./a) controls chickweed, purslane, lambsquarters and pigweed. Rates of 0.3 ounce of product per acre (5 grams a.i./a) can control dogfennel. Weeds should be treated when less than 4" tall and effectiveness may be reduced if rainfall occurs less than 4 hours after application. The cost per acre will vary, but when applying Ally® at 1.7 grams a.i./a, the cost of the herbicide might be $2.50 per acre.

Trials with this herbicide on *Pinus radiata* indicate the addition of a surfactant can increase phytotoxicity to pines (Dutkowski 1990). Seedling mortality was not observed when metsulfuron methyl (0.2 to 7.3 g a.i./a) was applied after sowing. However, when applied with a surfactant (Siloxane), death occurred at rates above 4 g a.i./a. At a nursery in New Zealand, complete mortality of several conifers (*Pinus nigra, P. ponderosa, P. contorta, P. radiata, P. sylvestris, Pseudotsuga menziesii* and *Larix deciduas*) was reported when a surfactant (Silwet L-77) was added to metsulfuron (Crozier 1990). Due to these reports, we did not include a surfactant in our tests.

## METHODOLOGY

Experiments were installed at four loblolly pine nurseries during the 2000 growing season. At the Alabama Forestry Commission Nursery at Atmore, seed were sown on April 16 and the seedlings were treated on June 7 (7 weeks after sowing). At the U.S. Alliance Nursery at Verbena, Alabama, seed were sown on April 11 and seedlings were treated on August 10 (17 weeks after sowing). At the Joshua Timberlands Nursery in Elberta, Alabama, seed were sown on May 1 and the herbicide was applied on June 8 (5 weeks after sowing). At the Weyerhaeuser Nursery at Pine Hill, Alabama, seed were sown on April 29 and the herbicide was applied on June 6 (5 weeks after sowing).

Each study was installed as a randomized complete block design with four replications. Plot size was 10-feet long and one bed wide. Each study involved three herbicide treatments plus an untreated control. Herbicides were applied using a $CO_2$-backpack sprayer calibrated to apply 28.4 gallons per acre. Treatments differed by nursery but all four studies included a rate of 0.2 ounce of product/acre. One test involved a tank mix of Oust® (1.3 ounces of product/acre) plus Ally®(0.2 ounce of product/acre). Seedling densities (i.e. number of seedlings per square foot) were recorded in mid-October 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. When F-values for treatment effects were significant (0.05 level), means were separated using Duncan's Multiple Range Test.

## RESULTS

Soil texture at the Elberta and Verbena Nurseries were classified as loamy sand, while the Atmore and Pine Hill Nurseries were classified as sandy loams (Table 1). No injury due to applying metsulfuron methyl was observed at the Atmore, Pine Hill, or Verbena Nurseries (Tables 2-4). In fact, seedlings treated with 0.2 ounces of product/acre (3.4 g a.i./acre) at the Verbena Nursery had heavier roots than seedlings that were not treated (Table 4).

Seedling injury was observed at the Elberta Nursery where stand density decreased across all rates tested (Table 5). This may have occurred because: (1) the seedlings were young (38 days from sowing); (2) the soil organic matter was low (1.2%); and (3) the sand content was high (82%). Although the soil texture is similar at the Verbena Nursery, the soil organic matter was higher and the seedlings were much older when treated (17 weeks old). Loblolly pine seedlings become tolerant of metsulfuron methyl with age. Transplanted 9-month old seedlings can tolerate rates up to 4 ounces of product/acre (68 g a.i./acre). Therefore, 4-month-old seedlings will be more tolerant of the herbicide than 1-month-old seedlings.

Treating 17-week old seedlings with either sulfometuron methyl or a tank-mix of sulfometuron methyl and metsulfuron did not injure seedlings at the Verbena Nursery (Table 4). This supports previous research that indicates loblolly pine has some degree of tolerance to sulfometuron methyl when seedlings are 8-weeks old. Casual observations determined that metsulfuron is more phytotoxic to emerged prostrate spruge than sulfometuron.

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

| Nursery | Soil Texture | Sand % | Silt % | Organic Matter % | pH |
|---|---|---|---|---|---|
| Atmore | Sandy loam | 57 | 26 | 3.2 | 4.8 |
| Elberta | Loamy sand | 82 | 10 | 1.2 | 5.4 |
| Pine Hill | Sandy loam | 68 | 20 | 2.0 | 5.6 |
| Verbena | Loamy sand | 81 | 11 | 1.0 | 5.0 |

**Table 2.** Morphological characteristics for loblolly pine seedlings lifted in October at the Pine Hill Nursery. High densities of nutsedge stunted seedlings in all plots.

| Metsulfuron Rate g ai/acre | Density (#/sq.ft.) | RCD (mm) | Height (cm) | Shoot (g) | Root (g) |
|---|---|---|---|---|---|
| 0 | 15.4 | 2.2 | 20.4 | 1.01 | 0.16 |
| 3.4 | 16.8 | 2.3 | 20.0 | 0.98 | 0.17 |
| 6.8 | 16.6 | 2.2 | 19.1 | 0.87 | 0.15 |
| 10.2 | 15.6 | 2.4 | 20.4 | 1.10 | 0.19 |
| *P > F-value* | *0.78* | *0.82* | *0.89* | *0.85* | *0.71* |
| *(LSD)* | *3.5* | *0.48* | *4.3* | *0.51* | *0.066* |

**Table 3.** Morphological characteristics for loblolly pine seedlings lifted in October at the Atmore Nursery.

| Metsulfuron Rate g ai/acre | Density (#/sq.ft.) | RCD (mm) | Height (cm) | Shoot (g) | Root (g) |
|---|---|---|---|---|---|
| 0 | 18.9 | 3.6 | 27.8 | 2.26 | 0.24 |
| 1.7 | 19.4 | 3.6 | 28.3 | 2.31 | 0.24 |
| 3.4 | 17.1 | 3.7 | 27.9 | 2.54 | 0.27 |
| 5.1 | 17.8 | 3.8 | 28.3 | 2.57 | 0.28 |
| *P > F-value* | *0.52* | *0.43* | *0.65* | *0.65* | *0.63* |
| *(LSD)* | *3.7* | *0.34* | *1.1* | *0.68* | *0.094* |

**Table 4.** Morphological characteristics for loblolly pine seedlings lifted in October at the Verbena Nursery.

| Metsulfuron Rate g ai/acre | Sulfometuron g ai/acre | Density (#/sq.ft.) | RCD (mm) | Height (cm) | Shoot (g) | Root (g) |
|---|---|---|---|---|---|---|
| 0 | 0 | 19.8 | 4.7 | 28.3 | 3.21 | 0.58 b |
| 3.4 | 0 | 19.9 | 4.7 | 24.9 | 2.95 | 0.70a |
| 0 | 28.4 | 20.6 | 4.7 | 25.3 | 2.83 | 0.65ab |
| 5.1 | 28.4 | 19.0 | 4.7 | 26.3 | 2.96 | 0.60 b |
| *P > F-value* | | *0.68* | *0.95* | *0.51* | *0.73* | *0.005* |
| *(LSD)* | | *2.8* | *0.36* | *4.9* | *0.45* | *0.064* |

**Table 5.** Morphological characteristics for loblolly pine seedlings lifted in October at the Elberta Nursery.

| Metsulfuron Rate g ai/acre | Density (#/sq.ft.) | RCD (mm) | Height (cm) | Shoot (g) | Root (g) |
|---|---|---|---|---|---|
| 0 | 19.5a | 4.0 | 25.2 | 2.39 | 0.27 |
| 3.4 | 16.4 b | 3.8 | 26.1 | 2.40 | 0.29 |
| 6.8 | 15.3 b | 3.7 | 26.0 | 2.54 | 0.30 |
| 10.2 | 16.7 b | 3.8 | 24.8 | 2.58 | 0.29 |
| *P > F-value* | *0.02* | *0.50* | *0.33* | *0.86* | *0.79* |
| *(LSD)* | *2.4* | *0.37* | *1.7* | *0.60* | *0.059* |

## MANAGEMENT IMPLICATIONS

Ally® can be applied to fallow land at a rate of 0.1 ounce of product per acre. Drift from this rate (equivalent to 1.7 g a.i./acre) will likely not hurt loblolly pine that are 8-weeks old and are growing on soils with 2% or more organic matter. However, young seedlings (less than 6-weeks old) may be injured when growing on sandy soils that are low in organic matter. To avoid seedling injury, nursery managers who manage sandy soils (with low organic matter content) should take precautions to minimize drift when applying Ally® to fallow areas adjacent to newly emerged pine seedlings. The addition of a surfactant will increase the activity on weeds but this will likely increase the chance of injury to young pines in nurseries. After pine seedlings leave the nursery and have been established in a plantation, they may be treated with 1 to 4 ounces of product (Escort®) per acre.

## REFERENCES

Crozier, E.R. 1990. Chemical control of wilding conifer seedlings. 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.