RESEARCH REPORT 06-01

TOLERANCE OF YOUNG LOBLOLLY PINE SEEDLINGS TO MSMA

by
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INTRODUCTION

Monosodium methanearsonate (MSMA) is an organic arsenical herbicide (Hiltbold 1975). MSMA has medium to low mobility in sandy soils and might leach 20 inches in a Norfolk sandy loam. It is strongly adsorbed to soil particles and the reported half-life averages about 6 months in non-irrigated soils. Under high irrigation the half-life in California was about 55 days. MSMA causes cell membrane destruction and rapid desiccation. Uptake by roots is limited and the primary pathway into plants is through the foliage.

MSMA has been used in cotton for decades to control annual grasses and sedges. It can be used in non-cropland around pipelines and fencerows. In 2002 more than 3 million pounds of MSMA were applied for weed control in the USA. In 1999, tests at Auburn University indicated that a single application (2 lbs active ingredient per acre) was effective in controlling flathead sedge (*Cyperus compressus*) (Belcher et al. 2002).

When attempting to control nutsedge, repeated applications of MSMA are often needed to provide effective control. For example, one study found that 60 days after applying MSMA (2 pounds active ingredient per acre), the number of nutsedge shoots was reduced by 68% for yellow nutsedge (*Cyperus esculentus*) and 48% for purple nutsedge (*Cyperus rotundus*) plants (McElroy et al. 2003).

About 36 years ago, J.P. Fulmer (1969) reported that weekly, directed applications of MSMA (applied using a shielded applicator) controlled nutsedge (*Cyperus spp*.) in an ornamental holly nursery (*Ilex spp*.). Some MSMA labels allow the use on nursery plantings of walnut and cherry. To keep the herbicide off the foliage of non-baring nut trees, these labels state: "Use a shield, if necessary, for nursery planting or young trees." Fortunately, a few managers learned that young southern pines were tolerant of broadcast applications of MSMA and use of a shield was not required. They spread the word and in 2004 the Nursery Coop established tests in pine seedbeds. In 2005, a preliminary trial was conducted to test the hypothesis that MSMA could selectively control *Cyperus compressus* in newly emerged loblolly pine seedbeds.

METHODOLOGY

Seed were sown at an Alabama nursery on May 3, 2005. The study was installed on June 2 when seedlings were 4 weeks old. Plot size was one bed wide and 10-feet long. The study involved three herbicide treatments plus an untreated control (replicated six times). MSMA (6 lbs a.i./gallon) was applied using a CO_2-backpack sprayer calibrated to apply 28 gallons per acre.

Treatments included rates of 8, 16 and 32 fluid ounces of product/acre. This is equivalent to 420, 840 and 1680 g of MSMA per ha. On June 22, a visual estimate of *Cyperus compressus* cover (i.e. % ground cover) was recorded for replications where weed population was uniformly distributed. Seedling densities (i.e. number of seedlings per square meter) were recorded on October 11 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

There was a significant effect of MSMA on seedling production, RCD, root and shoot dry weights (Table 1). The MSMA treatment had a positive effect on seedling growth due to the suppression of annual sedge. In just 20 days, the application of MSMA greatly reduced the amount of sedge cover (Table 2). The most effective control was obtained with 32 ounces of product per acre. As a result of effective weed control, seedling growth increased. No adverse effect of MSMA on seedling growth was observed.

MANAGEMENT IMPLICATIONS

These findings indicate that flathead sedge is susceptible to MSMA at rates of 800 to 1700 g/ha. Preliminary results suggest young loblolly pine have tolerance to these rates. However, greenhouse trials indicate that recently top-pruned seedlings could be injured (South and Hill 2005).

REFERENCES

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Table 1. Analysis of variance for loblolly pine seedlings as affected by MSMA.

Source	df	Density	RCD	Height	Shoot	Root	df	Sedge
		--------- Probability of a greater F-value ---------						
Replication	5	0.0001	0.1871	0.3473	0.1869	0.5536	3	0.4876
MSMA Treatment	3	0.0211	0.0044	0.6025	0.0146	0.0564	3	0.0001
Error	15						9	

Table 2. Morphological characteristics for loblolly pine seedlings and amount of weed competition.

Treatment	rate g/ha	Density (#/linear ft)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)	Sedge cover %
Control		35.3	3.7	24.6	2.04	0.28	84
MSMA	420	39.2	4.3	25.3	2.64	0.36	23
MSMA	840	44.5	4.3	25.5	2.72	0.38	9
MSMA	1680	46.5	4.4	25.4	2.79	0.38	4
Linear		*0.4011*	*0.8543*	*0.8841*	*0.6259*	*0.9625*	*0.9243*
Quadratic		*0.0034*	*0.0021*	*0.2623*	*0.0056*	*0.0177*	*0.0001*
Lack-of-fit		*0.5819*	*0.0237*	*0.4764*	*0.0661*	*0.1473*	*0.0001*
(LSD)		*7.3*	*0.36*	*1.65*	*0.47*	*0.08*	*13.8*