Auburn University
Southern Forest Nursery Management Cooperative

RESEARCH REPORT 08-05

SPURGE REDUCES SEEDLING GROWTH

by
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INTRODUCTION

Spurge (*Chamaesyce maculate*) is a troublesome weed in southern pine nurseries and container-grown horticultural crops. Oxyfluorfen (e.g. Goal®) provides some level of preemergence control but once spurge germinates and becomes established, it is difficult to control with most selective herbicides. Spurge is listed on a number of herbicide labels but listing the weed on a label does not mean the herbicide effectively controls spurge. For example, only metsulfuron-methyl provided excellent control of emerged prostrate spurge (South and Hill 2007).

In 2007, four herbicides (each having some activity on spurge germination) were tested at the Pine Hill Nursery in Alabama. The objective of this study was to determine if herbicides applied prior to the germination of spurge would provide effective early-season weed control in loblolly pine seedbeds.

METHODOLOGY

A study was installed at the Pine Hill Nursery during the 2007 growing season. Loblolly pine seeds were sown on April 9, 2007 and the seedlings were treated on May 10th. Plot size was one bed wide and 10 feet long. This study was installed before germination of spurge and involved various herbicide treatments plus an untreated control (replicated five times). Treatments (Table 1) were applied using a CO_2-backpack sprayer calibrated to apply 22 gallons per acre. The soil was a loamy sand (78% sand; 14% silt; 8% clay) with an organic mater content of 1.3% (soil pH = 5.1). The unit selected for the test was last fumigated in the fall of 2004.

Digital photos of plots were taken on June 11, 2007. Visual estimates of spurge cover (i.e. 50% cover… 85% cover) were made on July 27. Seedling densities (i.e. number of seedlings per square meter) were recorded on September 26 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. Seedling height and root-collar diameter 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 orthogonal contrasts and Duncan's Multiple Range Test.

RESULTS

Rainfall was well-below average in 2007, with some areas of Alabama under an extreme drought for the growing season. Spurge plants began to germinate in early May. In comparison to the untreated plots, all herbicides provided some level of spurge control. However, as time progressed, the spurge gradually occupied the soil surface. By mid-July, most treatments had more than 70% of the soil covered with spurge. The only exception was with the high rate of pendimethalin (Table 1).

Because of the early control of spurge (Figure 1), all herbicide treatments improved seedling morphology (Table 2). Pendimethalin, at 2.2 kg ai/ha, produced the largest and tallest seedlings (Table 3). In addition, seedlings treated with pendimethalin had needles that were dark green (vs. yellow-green for untreated seedlings). Among the herbicides tested, the two oryzalin treatments produced the smallest seedlings.

MANAGEMENT IMPLICATIONS

These findings indicate that in droughty years, spurge can reduce growth of pine seedlings and can result in chlorosis. This chlorosis may have resulted from the spurge limiting uptake of nitrogen. Suppressing spurge early in the season can have a measurable impact on seedling growth. This study indicates that Pendulum AquaCap® can provide effective short-term control of spurge and this can result in significant increases in height and diameter of seedlings at lifting. Pendulum AquaCap® is registered for use on field-grown nursery stock.

REFERENCES

South, D.B. and T. Hill. 2007. A spurge trial in Alabama. Auburn University Southern Forest Nursery Management Cooperative. Research Report 07-01. 3 p

Table 1. Herbicide treatments and visual assessment of spurge cover on July 26, 2007

Trade Name	Common name	Product/acre	g a.i./acre	Spurge cover (%)
Control	-- --		--	95 a
Oust	sulfometuron	1.33 ounce	28	74 c
Suregard	flumioxazin	6 ounce	85	82 bc
Pendulum AquaCap	pendimethalin	34 ounces	458	88 ab
Pendulum AquaCap	pendimethalin	68 ounces	916	46 d
Surflan AS	oryzalin	32 ounces	454	94 a
Surflan AS	oryzalin	64 ounces	908	87 ab

Table 2. Analysis of Variance for loblolly pine seedlings as affected by herbicides at the Pine Hill Nursery

Source	df	Density	RCD	Height	Shoot	Root
		------ Probability of a greater F-value ----------				
Replication	4	0.0210	0.5356	0.2226	0.7333	0.1356
Treatment	6	0.2465	0.0001	0.0001	0.0215	0.0001
sulfometuron vs control	(1)	0.0356	0.0027	0.0001	0.0094	0.0008
flumioxazin vs control	(1)	0.0356	0.0040	0.0028	0.0219	0.0013
pendimethalin vs control	(1)	0.4416	0.0001	0.0316	0.0013	0.0001
oryzalin vs control	(1)	0.2632	0.0844	0.0001	0.0569	0.0486
pendimethalin-linear	(1)	0.4749	0.0001	0.0001	0.0005	0.0001
oryzalin-linear	(1)	0.4749	0.0750	0.0443	0.1630	0.0304
Error	28					

Table 3. Morphological characteristics for loblolly pine seedlings at Pine Hill Nursery

Treatment	rate	Density (#/m^2)	RCD (mm)	Height (cm)	Shoot (g)	Root (g)
Control		260	2.3 c	16.9 d	1.0 c	0.10 d
sulfometuron	1X	256	2.9 b	21.7 ab	1.7 ab	0.19 b
flumixazin	1X	256	2.9 b	20.3 bc	1.6 ab	0.18 b
pendimethalin	1X	266	2.8 b	20.0 bc	1.6 ab	0.17 bc
pendimethalin	2X	266	3.5 a	23.2 a	2.0 a	0.26 a
oryzalin	1X	262	2.6 bc	18.8 cd	1.5 abc	0.13 cd
oryzalin	2X	266	2.7 bc	19.1 cd	1.3 bc	0.15 bc
(LSD)		*13.8*	*0.36*	*2.14*	*0.54*	*0.04*

Figure 1. The effect of pendimethalin (2.2 kg ai/ha) on spurge on June 12, 2007. Pendulum AquaCap® on left and untreated plot on right. Fumigated seedbeds contained relatively few spurge plants on this date.