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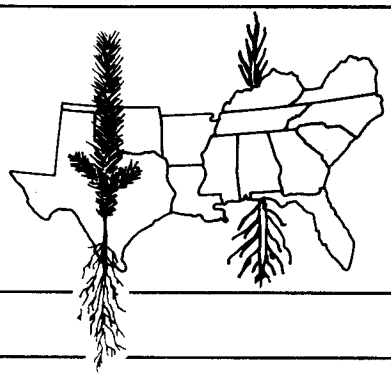

RESEARCH NOTE 96-3

Fomesafen: A Herbicide for Pine Seedbeds

by
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INTRODUCTION

Several herbicides in the diphenylether family have proven to be effective in southern pine nurseries. Bifenox, oxyfluorfen, and lactofen have been labeled for use on pine seedbeds based on data collected by the Auburn University Southern Forest Nursery Management Cooperative. Although once commonly used in southern pine nurseries, bifenox is no longer sold in the United States. To ensure effective weed control, it is important to have alternatives in case preferred products are suddenly withdrawn from the market. In addition, reliance on one herbicide can, in some cases, lead to a buildup of resistant weed species. For example, the percentage of nurseries with troublesome populations of nutsedge (yellow nutsedge Cyperus esculentus L. and purple nutsedge Cyperus rotundus L.) have increased since 1975.

The Cooperative began testing fomesafen, a new member of the diphenylether family, in 1984. This herbicide can control common nursery weeds such as large crabgrass (Digitaria sanguinalis (L.) Scop.), common purslane (Portulaca oleracea L.), carpetweed (Mollugo verticillata L.), Florida pusley (Richardia scabra L.), and pigweeds (Amaranthus sp.). In addition, it also has herbicidal activity on yellow nutsedge. It is formulated as a salt and therefore this herbicide will leach into the soil, resulting in activity against yellow nutsedge. Soil mobility is slightly greater than atrazine. Adsorption to soils is related to soil organic matter. Although the soybean label has some crop rotational restrictions, carryover problems to agronomic crops have rarely been observed.

METHODOLOGY

During 1984, and 1985, regional herbicide experiments were conducted at 12 forest nurseries in 11 states (Table 1). Herbicide plots (1.8 m by 2 m) were arranged in a randomized complete block design with eight replications at each nursery. For preemergence studies, the herbicide was usually applied right after sowing and mulching (except in the case of longleaf pine at the Claridge Nursery). Fomesafen was formulated as a liquid concentrate (22.8% active ingredient) and was mixed in 3.8 L of water and applied with a CO_2 powered sprayer. Soon after treatment, the area was irrigated with 1.3 to 1.9 cm of water. All plots were handweeded when necessary. At several nurseries, weeding times were recorded for each plot.

For postemergence studies, the nursery manager was allowed the option of applying a preemergence herbicide application just after sowing. Therefore, oxyfluorfen (0.56 kg ai/ha) was applied at sowing at most nurseries except for white pine in Kentucky.

Seedling tolerance to each treatment was evaluated within each plot during November and December by counting the number of seedlings that had root-collar diameters greater than 3 mm. In addition, samples of pines were lifted and weighed. Due to the smaller size of 1+0 white pine, only the total number of seedlings in each plot was recorded (seedlings were not lifted or weighed). Percent weed control for the first handweeding was determined by: percent handweeding reduction = [1-(handweeding time for herbicide treatment/handweeding time for control plot)] X 100. Statistical differences between treatments and controls were tested using multiple range tests.

RESULTS

Pine seedling tolerance

Fresh weight production for beds treated with fomesafen were numerically higher in six of the eight preemergence studies (Table 2). At three nurseries, seedling production was significantly increased due to suppression of weed population. However, a significant reduction in seedling production was recorded at the Columbia Nursery when 0.5 kg ai/ha of fomesafen was applied to loblolly pine seedbeds just after sowing. Soil texture is the primary difference between this nursery and other nurseries where no injury was observed. The Columbia Nursery has a soil with 21% sand content while others had greater than 50%.

When fomesafen was applied just after sowing, no apparent injury was observed on pines if the soil contained more than 50% sand. However, a severe reduction in seedling density was observed at the Columbia Nursery which is located on a silt loam soil (21% sand). Subsequent studies with preemergence applications on silt loam soils have been successful. Even so, the risk of injury appears greater on silt loam soils than on loamy sands. This may be related to the amount of herbicide which may be present near the soil surface at the time of seed germination. A study by Weber and associates in 1993 showed that after 40 days of irrigation, only 22% of the herbicide fraction remained in the soil surface (top 2.5 cm) of a sandy loam soil. However, 79%

remained in the surface of a silt loam soil.

No significant injury was observed when young seedlings were treated with postemergence applications of fomesafen at either 0.25 or 0.5 kg ai/ha (Table 2). In most cases, the treatment was made only four to six weeks after sowing. Even on a silt loam soil, young pine seedlings appear to be relatively tolerant to postemergence applications of fomesafen. However, injury can occur if a surfactant or crop-oil is added to the herbicide.

Weed Control

Even though the plot size was small, good weed control was demonstrated at several nurseries where weed populations were high enough to justify recording weeding times. Weed populations were highest on control plots at the Ashe nursery. Here total season handweeding of control plots amounted to 8.3 minutes/m^2 and the preemergence application of fomesafen reduced handweeding by 88%. At the Columbia Nursery, total season handweeding was 1.0 minute/m^2 for untreated plots and the fomesafen treatment reduced weeding by 86%. At the Munson Nursery, fomesafen reduced total season handweeding by 72% (2.4 minutes/m^2 for control plots).

Weed populations were low at most nurseries in 1985 due to applying oxyfluorfen at time of sowing. However, no such treatment was used on white pine and therefore weeding times were recorded at the Kentucky Dam Nursery. Total season handweeding amounted to 6.7 minutes/m^2 for control plots. The single postemergence application of 0.25 kg ai/ha reduced handweeding by 59% while the 0.5 kg ai/ha rate reduced weeding by 67%.

MANAGEMENT IMPLICATIONS

Fomesafen is one of the few herbicides which is selective on pine seedlings and has activity on nutsedge. It may be of particular importance for nutsedge control if methyl bromide is removed from the market. It can be used in both pre- and postemergent applications. When applying fomesafen postemergence to the pines, a surfactant or crop-oil should not be added to the spray mix. State registrations (24-C labels) now allow nursery managers to use fomesafen in pine seedbeds in the states of Alabama, Arkansas, Georgia, South Carolina, and North Carolina.

Table 1. Nursery location, sowing dates, treatment dates, and soil characteristics.

Nursery	State	Sowing Date	Application Date	Mulch	Soil texture	pH	Organic matter
Munson	FL	5/14/84	5/14/84	pine straw	loamy sand	5.4	1.2%
Columbia	LA	4/17/84	4/18/84	pine straw	silt loam	5.2	1.7
Ashe	MS	4/17/84	4/17/84	pine straw	sandy loam	4.8	1.0
Claridge	NC	10/10/83	4/30/84	wood chips	loamy sand	6.2	1.6
Edwards	NC	5/18/84	5/18/84	sawdust	loamy sand	5.2	1.3
Taylor	SC	5/ 2/84	5/ 2/84	pine straw	loamy sand	5.6	0.9
Alto	TX	4/18/84	4/19/84	wood shavings	sandy loam	6.4	1.1
New Kent	VA	5/ 8/84	5/17/84	none	loamy sand	5.6	1.9
Hammermill	AL	5/ 6/85	5/31/85	sawdust	sandy loam	6.0	0.9
Baucum	AR	5/ 6/85	6/12/85	none	silt loam	5.2	1.3
Kentucky Dam	KY	11/1/84	6/11/85	wheat straw	loam	5.2	1.2
Columbia	LA	4/12/85	6/13/85	pine straw	silt loam	5.2	2.0
Ashe	MS	4/30/85	6/ 7/85	pine bark	sandy loam	5.0	2.2
Taylor	SC	4/16/85	6/06/85	sawdust	loamy sand	4.8	1.3
Pinson	TN	5/ 6/85	6/11/85	sawdust	loam	5.6	1.8

Table 2. Plantable seedling densities and fresh weights of pine seedlings.

Nursery	Species	Herbicide rate (kg ai/ha) 0	0.5	0.25	0	0.5	0.25
PREEMERGENCE TO PINES		density (#/m^2)			weight (g/m^2)		
Munson	slash	268	279	--	2530	2822	--
Columbia	loblolly	224	161**	--	3474	3300	--
Ashe	shortleaf	175	366**	--	1255	3265**	--
Claridge	longleaf	256	234	--	3629	4028	--
Edwards	loblolly	222	231	--	1501	1557	--
Taylor	loblolly	119	176	--	1215	2022**	--
Alto	loblolly	49	151**	--	789	2580**	--
New Kent	loblolly	326	311	--	4694	4644	--
POSTEMERGENCE TO PINES							
Hammermill	loblolly	201	184	184	2022	1738	2001
Baucum	loblolly	165	157	153	2613	2372	2217
Kentucky Dam	white	310	311	316	--	--	--
Columbia	loblolly	214	230	242	4012	4118	4067
Ashe	shortleaf	262	265	254	1719	1668	1682
Taylor	loblolly	212	204	210	2268	2449	2436
Pinson	shortleaf	122	140	140	1357	1478	1757

* Significantly different from the controls at the 5-percent level of probability.
** Significantly different from the controls at the 1-percent level of probability.