WEED CONTROL IN NURSERIES

RECENT RESULTS WITH CHEMICAL WEED CONTROL IN PINE SEEDBEDS

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(Panel Moderator)

Since my last report (1), we have conducted studies at Auburn, Hauss, and Miller Nurseries in Alabama, Claridge Nursery in North Carolina, and Morgan Nursery in Georgia. Because of distances involved and shortage of time, we did not obtain complete data from all locations. But, interesting and encouraging results were obtained.

METHODS

All herbicides (table 1) were applied with hand sprayers operated at 30 p.s.i. and delivering 25 g.p.a. Screening studies were conducted at Auburn and Claridge Nurseries using 5- x 5-foot plots. Treatments were applied over the mulch within a few hours to a few days after sowing. At Auburn Nursery, three replications were installed on sawdust-mulched beds. At Claridge Nursery, three replications were installed on beds mulched with pine straw and three replications were on beds mulched with hydro-mulch (ca. 2,400 pounds per acre).

Pilot studies using 5- x 20-foot plots were conducted at the three Alabama nurseries. At Auburn Nursery, a study consisting of four treatments and four replications was installed in both loblolly and slash pine beds (4 to 8 days after sowing). A similar study was conducted at all three Alabama nurseries, except treatments were applied when seedlings were 8 to 10 weeks old and all beds had been hand-weeded to remove existing weeds. All beds at the Auburn Nursery were mulched with sawdust while pine straw mulch was used at the other. Alabama nurseries. In all studies, the beds were lightly irrigated immediately following treatment.

In most studies we were concerned, primarily, with the tolerance of the pine seedlings. Two methods of evaluation were used to judge tolerance. At the end of the growing season, three random samples of trees, each representing one square foot of bed, were lifted from each plot. The number of plantables (grades 1 and 2) (2) and percent cull were determined. A second method of evaluation involved visual ranking of plots from 1 through 5, with plot 1 representing complete kill of trees and plot 5 representing no visible injury. Rankings between 1 and 5 indicate intermediate degrees of injury.

1/ Panel presentation. Papers of panel participants are included.

Table 1.--Description of herbicides tested or discussed in text and tables

Common name	Trade name	Active ingredients
Alachlor	Lasso	2-chloro-2',6'-diethyl-N-(methoxymethyl) acetanilide
Ametryne	Evik	2-(ethylamino)-4-(isopropylamino)-6-(methylthio)-s-triazine
Atrazine	Aatrex	2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine
Chloroxuron	Tenoran	3-p-(p-chlorophenoxy)phenyl-1,1-dimethylurea
DCPA	Dacthal	dimethyl tetrachloroterephthalate
Diphenamid	Dymid, Enide	N,N-dimethyl-2,2-diphenylacetamide
EPTC	Eptam	S-ethyl dipropylthiocarbamate
Linuron	Lorox	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea
Nitralin	Planavin	4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylaniline
Norea	Herbam	3-(hexahydro-4,7-methanoindan-5-yl)-1,1-dimethylurea
Prometryne	Caparol	2,4-bis(isopropylamino)-6-(methylthio)-s-triazine
Trifluralin	Treflan	a,a,a,-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine
Vernolate	Vernam	S-propyl dipropylthiocarbamate

In two of the tests we obtained an estimate of the degree of weed control by recording the time required for two men to hand-weed each plot.

RESULTS

The results of screening studies at Auburn and Claridge Nurseries are shown in table 2. Diphenamid (4 and 8 pounds per acre) and vernolate (3 and 6 pounds per acre) were not injurious and are worthy of further testing. Trifluralin (1 and 2 pounds per acre), previously found to be safe at Auburn Nursery (2), was also not injurious at Claridge Nursery (table 2). The results with prometryne, however, were not consistent.

At Auburn Nursery, where sawdust was used as mulch, prometryne at 5 pounds per acre caused no visible injury, but at Claridge Nursery, the 4 and 5 pounds per acre rates were injurious on beds mulched with pine straw. All rates were highly toxic on beds receiving hydro-mulch (table 2). A number of edaphic, climatic, or cultural factors could contribute to this variation in tolerance, but the most obvious factor is the type of mulch. At Claridge Nursery, the hydro-mulched and straw-mulched beds were immediately adjacent to each other, were planted the same day, and treated with herbicide the same day, thus minimizing variations in soil, irrigation, fertilization, etc. The herbicides were applied directly on the mulch so the rate of binding and/or release by the mulch could significantly influence tolerance. However, the problem is probably more complex. The trees in the untreated portions of the hydro-mulched beds at Claridge Nursery were considerably smaller and less uniform than trees in the pine straw-mulched beds indicating that the hydro-mulch reduced seedling growth and vigor which could decrease seedling tolerance. Additional tests are needed before drawing any firm conclusions.

In one pilot study at the Auburn Nursery, we applied herbicides to 20-foot plots at planting. We planned to obtain data on the degree of weed control, but an abundance of nutsedge (Cyperus rotundus), which is resistant to the pre-emergence herbicides used, necessitated the use of mineral spirits on these beds. Data on seedling production in this study are presented in table 3. Prometryne (3 pounds per acre) did not affect the number of plantable trees or percent cull in either loblolly or slash. Trifluralin (1 pound per acre) resulted in fewer plantables and higher cull percent in loblolly, but these effects were not significant at the 5 percent level.

Table 4 presents data from studies where the herbicides were applied to seedlings 8 to 10 weeks after germination. At Miller Nursery, the weed population was not sufficient to evaluate and we were unable to obtain trees for grading at the Hauss Nursery, but the

Table 2.--Average ratings of seedlings in screening study on loblolly pine[1/]

Treatment	Average rating[2/]		
	Claridge Nursery		Auburn Nursery
	Hydro-mulch[3/]	Pine straw mulch	Sawdust mulch
Control - 1	4.3	4.0	5.0
Control - 2	3.3	4.0	4.8
Prometryne 3 lb./A	2.1	4.3	4.2
Prometryne 4 lb./A	1.5	3.3	4.5
Prometryne 5 lb./A	1.1	2.7	5.0
Diphenamid 4 lb./A	4.2	4.6	5.0
Diphenamid 8 lb./A	4.0	4.6	4.2
Norea 1 lb./A	3.7	3.3	--
Norea 2 lb./A	1.7	2.0	3.7
Norea 3 lb./A	--	--	2.7
Linuron + Atrazine 2 + 2	--	--	3.5
Linuron + Atrazine 4 + 4	--	--	2.2
Alachlor (Lasso) 2 lb./A	3.3	4.6	--
Alachlor (Lasso) 4 lb./A	2.3	2.5	--
Vernolate 3 lb./A	3.8	4.3	--
Vernolate 6 lb./A	4.3	4.6	--
Trifluralin 1 lb./A	4.2	4.3	--
Trifluralin 2 lb./A	4.7	4.3	--
Nitralin 1 lb./A	2.0	2.7	--
Nitralin 2 lb./A	1.3	2.0	--

1/ All treatments applied immediately after sowing and mulching.

2/ Rating system was 5 - no injury, perfect stand; 1 - all seedlings dead. Various degrees from 1-5 were estimated. Average rating of 4.0 or above indicates essentially no injury.

3/ Hydro-mulch applied at 2,400 pounds per acre.

Table 3.--Loblolly and slash pine seedling production following chemical weed control applied at planting time[1/]

Treatment	Loblolly pine[2/]		Slash pine[2/]	
	Plantable trees per square foot	Cull	Plantable trees per square foot	Cull
	Number	Percent	Number	Percent
Control	[3/]23	30	22	29
Prometryne 3 lb./A	24	21	24	26
Trifluralin 1 lb./A	18	41	26	18
Trifluralin + Prometryne 1 + 3 lb./A	15	46	22	25

1/ Study conducted at the Auburn Nursery on beds mulched with sawdust. Loblolly planted April 7; slash, April 11. Herbicides applied April 15. Seedlings counted and graded November 26.

2/ Differences between treatments not significant.

3/ Represents average of three samples from each of four blocks.

Table 4.--Results of herbicide applications to 8- to 10-week-old pine seedlings[1/]

Treatment	Auburn Nursery		Miller Nursery[2/]	Hauss Nursery[3/]
	Loblolly		Loblolly	Slash
	Weeding time per acre	Plantable trees per square foot	Plantable trees per square foot	Weeding time per acre
	Hours	Number	Number	Hours
Control	8.1	27	20	10.9
Prometryne 3 lb./A	4.2*	28	18	3.8*
Trifluralin 1 lb./A	6.8	23	20	9.9
Diphenamid 8 lb./A	4.0*	29	19	8.7

1/ Seedlings sowed in April and herbicides applied in June. Weeding data collected 4 weeks after treatment; seedling data collected in November. Bed mulch was sawdust at Auburn Nursery and pine straw at other nurseries.

2/ Weeding data not collected at Miller Nursery.

3/ Seedling data not available from Hauss Nursery but no damage apparent from treatments.

* Indicates a significant difference from control (P 0.05).

results were encouraging at all locations. Prometryne (3 pounds per acre) significantly reduced weeding time at Auburn and Hauss Nurseries. Diphenamid (8 pounds per acre) gave effective weed control at Auburn Nursery. None of the treatments reduced the size or number of seedlings.

DISCUSSION AND CONCLUSIONS

Further testing has confirmed early observations that effective chemical weed control can be achieved without visible seedling injury. Prometryne at rates not exceeding 3 pounds per acre, applied before or after pine seed germination, appears particularly useful in loblolly or slash pine mulched with sawdust or pine straw. However, we need considerably more data on the performance of prometryne on different mulches and soils. Also, we need data on the dissipation of the herbicide from seedbeds and the survival and growth of out-plantings from treated seedbeds. Most of all, we need large scale tests on an operational basis.

We have concentrated our efforts on prometryne and trifluralin, but there are several other herbicides which may be more suitable under certain conditions. Ametryne, cloroxuron, DCPA, diphenamid, EPIC, and vernolate are worthy of further testing (2).

It is essential that herbicide trials be conducted with a high degree of procision. Sprayers must be accurately calibrated to apply the desired rates, since errors in the rate of application may result in poor weed control or excessive seedling injury. Also, 100 percent weed control should not be expected. Handweeding and mineral spirits will still be needed; but, hopefully, at a reduced rate which should more than offset the cost of the herbicide.

1. Carter, M. C. 1968. Herbicides. Proc. Southeast. Area Forest Nurseryman's Conf., pp. 47-48.

2. and J. Martin. 1967. Chemical weed control in southern forest nurseries. Auburn U., Auburn, Ala. Agr. Expt. Sta. Cir. 156, 12 PP.

3. Wakeley, P. C. 1954. Planting the southern pines. U. S. Dept. Agr. Mono. 18, 233 pp.