A FURTHER PROGRESS REPORT: COOPERATIVE WEED CONTROL PROJECT

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INTRODUCTION

Since 1972 when the first report on this project was made to this group, a great many significant changes have occurred in the pesticide industry. In 1972 our work had taken the direction of larger operational type studies based on 1971 test results. However, the passage of the new pesticide use law changed our objectives. We had thought that once the information was obtained that herbicides could be used effectively and safely in forestry nurseries that each state could label these herbicides for use in nurseries inside its own borders without requiring federal approval. This is not possible under the new law. Any pesticide must be specifically labeled by EPA for any use to be legal. For this reason, we returned in 1973 to smaller plots that could be monitored more effectively. Smaller plots provide more uniform, high quality data that can be used for label application to EPA.

FIELD TESTS

1972 Operational Studies - During 1972, larger study areas were treated on an operational basis. The major treatments were trifluralin (Treflan) at one pound active ingredient per acre (ai/A), diphenamid (Enide 50W or Dymid 80W) at 4 lb. ai/A and diphenamid plus prometryne (Caparol) at (4+1) lb. ai/A. Data from these studies are not presented here because the tests were not uniform and this presentation would require too much space. Weed control varied from location to location but, overall, these treatments were effective in controlling weeds and seedling production was not significantly effected.

1973 Uniform Tests in Pine Seedbeds – In 1973 we conducted small uniform plot studies again as we had done in 1971. Our major objective was to obtain more detailed data for label applications and in addition to screen two new herbicides for seedling tolerance and weed control effectiveness. Locations of the tests are listed in Table 1 along with pertinent soil information. Herbicides in the tests are listed in Table 2. Herbicide treatments were applied with a hand held sprayer to 6 x 50 foot plots and were replicated four times. Application volume was 25 gallons per acre at about 24 psi. Treatments were applied to seeded and mulched seedbeds and immediately irrigated with .5 to .75 inches of water to expedite penetration. Hand-weeding times were recorded by the nurserymen during the growing season. Seedling production was evaluated at the end of the growing season by selecting at random two 4-foot square areas per plot for plantable seedling counts. Two subsamples of 25 plantable seedlings were selected per plot and their fresh weight was determined. Pre-emergence weed control and seedling production are summarized in Tables 3 thru 5.

Trifluralin at 1 lb. ai/A and diphenamid at 4 lb. ai/A continued to be consistent in providing weed control at most locations with little or no effect on seedling growth and development. At the Baucum Nursery in Arkansas diphenamid reduced seedling fresh weights slightly but this was not detectable visually and is not considered serious enough to prohibit use. Very heavy rainfall shortly after treatment may have contributed to more diphenamid reaching the root zone of the seedlings. At the Pinson Nursery in Tennessee, diphenamid did not provide significant levels of weed control even though it had performed well there in the past. This is significant in that nurserymen should recognize that no two growing seasons are alike and that if a herbicide works well some years it may not do so well others. Different weed species tend to predominate each year and if the herbicide does not provide adequate weed control a particular year then the predominate species may be outside of that herbicide's spectrum of weed control. Also weather and soil conditions effect herbicide action differently from year to year. Weed problems vary too much for one herbicide to be effective at all of the nurseries across the Southeast.

Prometryne at 1 lb. ai/A applied preemergence provided good to excellent weed control at most locations. However, what we had suspected as possible finally happened. We felt that there was always an element of risk that seedling injury might occur in using prometryne preemergence on pine seedbeds. At the Baucum Nursery in Arkansas prometryne at 1 lb. ai/A significantly reduced seedling stands. The soil type was a loamy sand with only 1.16% organic matter and the seedbeds were not mulched. Following treatment a rainfall of about one and one-half inches was recorded. All these factors created the ideal conditions for seedling injury to occur. Based on these findings we have reconsidered the use of prometryne as a preemergence herbicide and have decided that the risk of seedling losses is too great for use to be feasible. In addition to this we have been unable to make any progress toward EPA clearance for its use in nurseries. We have found that prometryne can be used safely at 1 lb. ai/A postemergent to seedlings for late season weed control. Again, however, this is not a cleared practice.

Screening of A-820 for seedling tolerance and weed control indicated that we could get good to excellent weed control with A-820 at 2 lb. ai/A with no seedling injury. Application for clearance by EPA for its use in forestry nurseries is now pending. When it is cleared it will broaden our spectrum of weed control. It will especially help where common purslane (Portulaca oleracea) is the major problem weed.

MBR-8251 applied preemergence at 3 and 6 lb. ai/A was too phytotoxic to seedlings to be used at these rates. It, however, gave good weed control (Tables 3 to 5). Further tests are being conducted this year at lower rates.

Several postemergent studies were conducted in 1973. We found that any of the preemergence herbicides could be applied postemergent to the seedlings when they were 6 to 12 weeks of age for late season weed control with no measurable seedling injury. Excepting MBR-8251 which was phytotoxic to the trees when applied postemergent. As mentioned above prometryne

gave good weed control when applied postemergent at 1 lb. ai/A. Other Studies – Nutsedge (Cyperus rotundus and C. esculentus) continues to be a serious problem in many nurseries. At the Mt. Olive Nursery in Mississippi we conducted a fumigation study with sodium azide for nutsedge control. Results are summarized in Tables 6 and 7. We wanted to study the possibility of using sodium azide without a plastic tarp cover. Nutsedge control was 98% with a plastic tarp cover and 92% when water sealed. Other weed species were reduced significantly for the entire season in the tarped plots but not in the water sealed plots. Seedling production was enhanced significantly on the fumigated plots. The ease of application of this granular material makes it much more appealing than methyl bromide as a fumigant. Also, the possibility of its use without a tarp would make fumigation much less expensive because of reduced labor needs. How long will it be before it will be available for general use? We don't know, but it appears to be a bright future prospect.

Three weed control studies were conducted in cottonwood cuttings during 1973 (Tables 8 thru 11). Trifluralin at 1 lb. ai/A and A-820 at 2 and 4 lb. ai/A provided good to very good weed control at all three locations with no cutting injury. Simazine at 3 and 6 lb. ai/A was too phytotoxic to cuttings at the Winona Nursery in Mississippi and the Baucum Nursery in Arkansas to be useful. There was some tolerance to simazine in established rootstocks but it is not sufficient to permit use of simazine even on established rootstocks.

1974 Uniform Herbicide Tests - This year we have 10 tests in 8 of the 12 cooperating states. These studies include four new herbicides: Tolban (profluralin), Devrinol (napropamide), Modown (bifenox) and Surf lan (oryzalin). Prof luralin and bifenox are showing promise. Napropamide is providing good weed control but is causing some injury to seedlings. Bifenox has some postemergent activity on small broadleaf weeds and some small grasses. It may help fill the spot left by our inability to get prometryne uses cleared by EPA.

Other studies in 1974 – Sodium azide is being tested again as a soil fumigant but at higher rates than last year in an attempt to increase effectiveness of watersealed fumigation. Weed control studies in cottonwood cuttings are also being investigated again this year.

Now and the Future - At present only Enide 50W (diphenamid) has been cleared for preemergence use on both loblolly and slash pine seedbeds. By no means can this one herbicide do the job at all the nurseries. Diphenamid provides control of most grasses, but controls only a few broadleaf weeds. Treflan (trifluralin) and Dymid 80W (diphenamid) can be used on established loblolly and white pine seedlings, but none of the other pine species are covered by their professional labels.

Future labeling of Amex-820 (A-820) is very likely and this would be another big step toward our goal. Modown (bifenox) is very promising as a broadleaf controlling herbicide and perhaps as a postemergent herbicide.

It is very important that we all realize the days of "shoot and watch" are over. We are now under a law that is very strict in regulating the use of all pesticides. If the label is not explicit for use on a particular pine species, it is illegal to use the pesticide on that species. It makes no difference that we have good past results on which to base our use. The pesticide must be labeled for every specific use. To avoid prosecution every pesticide user must restrict applications to the labeled allowances. It is the individuals responsibility to read, understand, and abide by the labels. Let's don't get too venturesome. This is a new tool to help us do a better job in raising seedlings. Use it to its maximum benefit, but use it wisely.

Acknowledgments and Appreciation - In conclusion, I would like to thank all of the nurserymen for their excellent help and cooperation in the establishment and evaluation of these tests. I have been unable to work in all 12 states of the cooperative but would like to thank those states where I have not worked for their interest and moral support of this work. To the Foresters in the state offices I thank you for your support, also. Thanks to the U.S. Forest Service for their continued support.

We have made considerable progress on a hugh problem in the past three years, but we have a long way to go before we reach an acceptable plateau.

Table 1

Soil Information from 1973
Pre-Emergence Herbicide Trial Sites

State	City	Nursery	Texture Class	pH	Percent Organic Matter*
Arkansas	Little Rock	Baucum	Loamy Sand	5.6	1.16
Alabama	Autaugaville	Miller	Sandy Loam	5.0	2.26
Florida	Milton	Munson	Loamy Sand	5.8	2.15
Kentucky	Gilbertsville	Kentucky Dam	Sandy Clay Loam	5.9	2.78
North Carolina	Goldsboro	Claridge	Loamy Sand	5.8	1.90
North Carolina	Morganton	Edwards	Sand	5.3	1.87
South Carolina	Sumter	Tilghman	Sandy Loam	5.8	3.44
South Carolina	Sumter	Tilghman**	Loamy Sand	5.9	4.54
Tennessee	Pinson	Pinson	---	---	---

* Percent loss on ignition

** Fall planted spring treated Longleaf Pine location

Table 2

Herbicides included in the uniform tests during 1973.

Common Name	Formulation	Chemical Name	Trade Name and Manufacturer
Trifluralin	4 lb./gal. EC	α,α,α-trifluoro-2, 6-dinitro-N, N, dipropyl-p-toluidine	Treflan Elanco Products
Diphenamid	80WP or 50WP	N, N-dimethyl-2, 2-diphenylacetamide	Dymid 80W or Enide 50W Elanco Products or Tuco Products
A-820	4 lb./gal. EC	N-sec-butyl-4-tert-butyl-2, 6-dinitroaniline	Amex-820 Amchem Products
Prometryne	80WP	2, 4-bis (isopropylamino)-6-mercapto-s-triazine	Caparol CIBA Geigy Corp.
MBR-8251	50WP	1, 1, 1-trifluoro-4'-(phenylsulfonyl) methanesulfono-o-toluidide	Destun 3M Co.

Table 3

Pre-Emergence Weed Control and Seedling Production
in Loblolly Pine Seedbeds at Baucum Nursery, Little Rock, AK. 1973.

Treatment	Rate	Handweeding Time (min.) days after treatment	Plantables	Fresh Weight of 25 Plantables (gr)
	lb ai/A	63	per ft^2	
trifluralin	1	1.2 c[2]	25 a	246 de
trifluralin + prometryne	1 + 1	.7 c	13 de	254 cde
diphenamid (Dymid 80W)	4	.1 c	15 de	223 e
diphenamid + prometryne	4 + 1	1.0 c	5 fg	309 b
dipehnamid (Enide 50W)	4	.2 c	15 d	226 e
diphenamid + prometryne	4 + 1	.4 c	8 f	268 bcd
A-820	2	.4 c	20 bc	280 bcd
A-820	4	5.7 a	16 d	280 bcd
prometryne	1	.5 c	11 e	281 bcd
prometryne	2	2.1 bc	4 g	386 a
MBR-8251	3	.1 c	0 h	0 f
MBR-8251	6	.0 c	0 h	0 f
Control	0	4.0 ab	22 ab	268 bcd
Control	0	5.5 a	16 cd	297 bc

[1] Handweeding time expressed as man-minutes per 6' by 50' plot. Weeding time from planting and treatment May 11, 1973 to July 13, 1973.

[2] Any two means not followed by the same small letter are significantly different at the 5% level as judged by Duncan's New Multiple Range Test.

Table 4

Pre-Emergence Weed Control in Loblolly
Pine at Kentucky Dam Nursery, Gilbertsville, KY. 1973.

Treatment	Rate lb ai/A	Handweeding Time (min) 1/ (90 days after treatment)
trifluralin	1	44.0 de 2/
trifluralin + prometryne	1 + 1	47.0 bcd
diphenamid (Dymid 80W)	4	51.0 b
diphenamid + prometryne	4 + 1	40.5 ef
diphenamid (Enide 50W)	4	49.5 bc
diphenamid + prometryne	4 + 1	47.5 bcd
A-820	2	41.0 ef
A-820	4	38.0 fg
prometryne	1	45.0 cde
prometryne	2	43.5 de
MBR-8251	3	40.5 ef
MBR-8251	6	34.0 g
Control	0	61.5 a
Control	0	63.5 a

1/ Handweeding time expressed as man-minutes per 6' by 50' plot.

2/ Any two means not followed by the same small letter differ significantly at 5% level as judged by Duncan's New Multiple Range Test.

Table 5

Pre-Emergence Weed Control and Seedling Production
in Shortleaf Pine at the Pinson Nursery, Pinson, TN. 1973.

Treatment	Rate lb ai/A	Total Season Handweeding Time (min) [1]	Plantables per ft^2	Fresh Weight of 25 Plantables (gr)
trifluralin	1	8.3 c [2]	12 abc	354 a
trifluralin + prometryne	1 + 1	6.7 c	10 bcd	350 ab
diphenamid (Dymid 80W)	4	12.9 b	13 abc	308 abc
diphenamid + prometryne	4 + 1	6.5 c	10 cd	329 abc
diphenamid (Enide 50W)	4	15.9 b	13 ab	274 c
diphenamid + prometryne	4 + 1	6.0 c	12 abc	312 abc
A-820	2	7.9 c	14 a	337 abc
A-820	4	5.6 c	11 abcd	320 abc
prometryne	1	6.9 c	12 abc	308 abc
prometryne	2	4.8 c	9 d	332 abc
MBR-8251	3	6.5 c	2 e	291 abc
MBR-8251	6	4.5 c	1 e	85 d
Control	0	15.8 b	11 bcd	283 bc
Control	0	26.4 a	12 abc	286 abc

[1] Handweeding time expressed as man-minutes per 6' by 50' plot for the entire weeding season May 16, 1973 to August 29, 1973 (105 days).

[2] Any two means not followed by the same small letter differ significantly at the 5% level as judged by Duncan's New Multiple Range Test.

Table 6

Nutsedge and General Weed Control with Sodium Azide Fumigation at Mt. Olive Nursery, Mt. Olive, MS. 1973.

Treatment	Rate lb/A	Nutsedge Plants per 10 ft^2 [1]	Other Weeds per 10 ft^2 [2]	Total Season Handweeding Time [3]
sodium azide plastic cover	100	.50 a [4]	.25 b	44.0 b
sodium azide water sealed	100	1.92 a	1.33 b	71.3 a
Control	0	23.23 a	5.08 a	95.3 a

[1] Four 10 ft^2 counts were made per 100 ft plot July 12, 1973 9 days after planting of loblolly pines.

[2] Most of the other weeds counted were small flower morningglory (Jacquemontia tamnifolia).

[3] Handweeding time expressed as man-minutes per 6' by 100' plot. Total season was from July 3, 1973 to September 25, 1973 (84 days). Treatment was made June 5, 1973 and trees were planted July 3, 1973.

[4] Any two means not followed by the same small letter differ significantly at the 5% level as judged by Duncan's New Multiple Range Test.

Table%

Loblolly Seedling Production Following Sodium Azide Fumigation
at Mt. Olive Nursery, Mt. Olive, MS. 1973.

Treatment	Rate lb/A	Seedlings[1] per ft^2	Plantables[3] per ft^2	Fresh Weight[3] of 25 Plantables (gr)	Average[4] Height (cm)
sodium azide plastic cover	100	20 a[2]	17 a	258 a	29 a
sodium azide water sealed	100	19 a	16 a	235 a	29 a
Control	0	20 a	9 a	152 a	20 b

[1] Seedling stands 9 days after planting.

[2] Any two means not followed by the same small letter differ significantly at the 5% level as judged by Duncan's New Multiple Range Test.

[3] Plantables and Fresh weights taken at the end of the season.

[4] Five height measurements were made per plot on November 6, 1973.

Table 8

Pre-Emergence Weed Control Ratings and Cutting Injury Ratings in Cottonwood Following Herbicide Treatment at Auburn Nursery, Auburn, AL. 1973.

Treatment	Rate lb ai/A	Weed Control Ratings [1]	Cutting Injury Ratings [2]
simazine	3	9.0	0
simazine	6	8.8	0
simazine + trifluralin	3 + 1	9.5	0
trifluralin	1	7.0	0
A-820	2	7.5	0
A-820	4	8.0	0
simazine + A-820	3 + 2	9.0	0
control	0	0	0

[1] Ratings made August 18, 1973 after treatment June 6, 1973. 0 = no weed control 10 = complete weed control. Each entry average of ratings on four replications.

[2] Ratings made at the end of growing season. 0 = no injury 10 = severe injury or complete kill. Each entry is the average of ratings on four replications.

Table 9

Pre-Emergence Weed Control Ratings and Cutting Injury Ratings in Cottonwood Following Herbicide Treatment at Baucum Nursery, Little Rock, AK. 1973.

Treatment	Rate	Weed Control Ratings[1/]	Cutting Injury Ratings
simazine	3	4.3	7.0
simazine	6	5.0	8.8
simazine + trifluralin	3 + 1	5.8	7.3
trifluralin	1	4.8	.8
A-820	2	8.0	0
A-820	4	7.3	0
simazine + A-820	3 + 2	8.0	8.5
control	0	0	0

[1/] Ratings made late in the season. 0 = no weed control or cutting injury 10 = complete weed control or severe cutting injury. Each entry is the average of four replications.

Table 10

Pre-Emergence Weed Control and Cutting Injury in Cottonwood Following Herbicide Treatment at Winona Nursery, Winona, MS. 1973.

Treatment	Rate lb ai/A	Handweeding Time (min)[1]	Cutting Injury Ratings[3]
simazine	3	1.9 d[2]	4.5
simazine	6	2.7 cd	5.8
simazine + trifluralin	3 + 1	1.7 d	1.8
trifluralin	1	6.4 ab	.8
A-820	2	8.0 a	0
A-820	4	5.1 bc	0
simazine + A-820	3 + 2	2.3 d	2.5
control	0	6.7 ab	0

[1] Handweeding time was taken June 25, 1973 after treatment March 27, 1973 (90 days). Time expressed as man-minutes per 6' by 50' plot.

[2] Any two means not followed by the same small letter differ significantly at the 5% level as judged by Duncan's New Multiple Range Test.

[3] Injury ratings made July 18, 1973. 0 = no injury 10 = severe injury or complete kill. Each entry is the average of ratings on four replications

Table it

Pre-Emergence Weed Control and Wood Growth in Third Season Cottonwood Rootstocks Following Herbicide Treatment at Winona Nursery, Winona, MS. 1973.

Treatment	Rate lb ai/A	Handweeding Time (min) [1]	Injury Ratings [3]
simazine	3	2.3 abc [2]	0
simazine	6	2.8 ab	0
simazine + trifluralin	3 + 1	2.3 abc	0
trifluralin	1	2.3 abc	0
A-820	2	2.0 bc	0
A-820	4	1.7 c	0
simazine + A-820	3 + 2	1.9 bc	0
control	0	3.0 a	0

[1] Handweeding time expressed as man-minutes per 6' by 50' plot. Weeding time recorded late in the season.

[2] Any two means not followed by the same small letter differ significantly at the 5% level as judged by Duncan's New Multiple Range Test.

[3] Injury ratings made July 18, 1973 following treatment on March 27, 1973. 0 = no injury 10 = severe injury or complete kill. Each entry is the average of four replications.