BRIEF TRIALS OF A CHEMICAL GROWTH RETARDANT ON SOUTHERN PINE SEEDLINGS

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This presentation should not be considered an endorsement of the product under discussion. Its purpose is to inform you of limited trials at the Buckeye Cellulose Corporation Nursery and the St. Regis Nursery at Lee, Florida, with the growth retardant known commercially as MH-30T .

Mr. Erdman West, Jr. received information concerning MH-30T at the end of the 1962-63 planting season. With about 1.5 million excess slash seedlings left in our nursery, he decided to try this chemical on these seedlings. The following information concerning MN-30T was obtained from brochures of the U. S. Rubber Company.

The active ingredient in MH-30T is maleic hydrazide. Each gallon contains 3 pounds of maleic hydrazide, which is present as an amine salt to make it soluble in water.

The growth inhibiting properties of maleic hydrazide were discovered by a U. S. Rubber scientist in 1947. The chemical is absorbed by the leaf of a plant and is translocated to active growing regions. The plant cells continue to expand, but they do not divide.

Maleic hydrazide has been used in the agricultural chemical field since its discovery in 1947. The most widely known use has been in the control of tobacco suckering. The chemical has also been used in retarding the growth of grass along highways and on golf courses.

For the control of grass growth in the spring, 1-1/3 gallons per acre of MH-30T in 50 gallons of water is recommended. Product cost is about $16 per gallon. We used 1/2-gallon of MH-30T per acre in each application at the Buckeye Cellulose nursery.

The seedlings had made about 4-inches of new growth before the first application. A total of four applications were made between April 1 and August 1 with the same sprayer and nozzles used to apply fermate. The material was applied at 350 pounds pressure. Spray rate for the first two applications was 50 gallons of total solution per acre. The last two treatments were sprayed at the rate of 100 gallons per acre.

The first application was made April 1, 1963. A few days after the first application, the new growth on some of the seedlings turned brown and the rate of growth was noticeably reduced on <u>all</u> seedlings. The seedlings on the outside of the bed continued to grow more than those on the interior of the bed. Three weeks later the seedlings appeared to be overcoming the effect of the MH-30T and another application of 50 gallons

of solution was made on April 22, 1963. Seedling growth was much less than normal immediately following the second application.

The hold-over seedlings did not receive any treatment from April 22 to June 24. On June 24, we used a knife to cut off the tops of seedlings that had grown above the adjacent seedlings.

Streaking from the first and second applications made it obvious that we were not getting uniform spray coverage. Some terminals turned brown, some died, and some were unaffected.

In order to get better coverage, the spray rate was increased to 100 gallons per acre on the last two applications. After treating with the higher volume on July 1, no further increase in streaking was noted, and a uniform reduction in growth was apparent. The last application was made July 29, 1963.

It should be noted that the treated seedlings were not watered, and that this was a very dry summer. The seedlings were not watered because watering and fertilizing offsets the growth inhibiting effects of MH-30T .

We began lifting and planting bed-run treated seedlings the last week in November, and planted about 70,000 per week until the first week in January. By this time, the treated seedlings looked so bad that their planting was discontinued. We had planted 500,000 treated seedlings at this time. The last 100,000 seedlings were roughly culled as they were lifted.

The see Things ranged in color from dark green through pale yellow and red. They were of various sizes and shapes, ranging from normal to forked and greatly branched. Many seedlings in the bed were dead.

The root system was more uniform in size than the tops. The root system was larger than 1-0 stock, but did not require pruning to plant. The dry summer probably was a factor in the lack of excessive root development.

The survival plots established at time of planting were checked August 4, 1964. Based on these survival plots, overall survival of the treated seedlings was 42 percent. There was no significant survival difference in the first and last planting. Overall survival of normal 1-0 seedlings planted on the same sites as treated was 81.2 percent.

We planted a few treated seedlings July 17, and August 28, 1963, while trying out our tree planters. No plots were established but the seedlings planted in the dry month of July survived best on a well-drained site. All seedlings planted on a poorly drained site died even though the seedlings were not flooded out.

Survival of those planted in August was approximately 60 percent. We planted some normal seedlings in August next to the treated seedlings. Survival and growth of the normal seedlings was much better than that of the treated seedlings.

11-30T was used by Messrs. Joe L. Stafford and Junior Allen at the St. Regis Nursery near Lee, Florida. Mr. Stafford has made the following information available.

They improved on our method of application by using their mineral spirits nozzles (No. 800 1). This smaller nozzle permits the uniform application of 50 gallons of solution per acre at 100 pounds pressure.

They used 1/2-gallon of MH-30T per acre in each application.

On September 15, 1963, loblolly seedlings were sprayed with a 100 gallon solution by making two passes. Even though these seedlings received an extra amount of watering, growth stopped within three days amino new growth was noted until the middle of February, 1964. The terminal stiffened up and turned brown, but did not die.

On March 10, 1964, slash seedlings were sprayed with 100 gallons of solution by making two passes. On March 17, 1964, one-half of the treated slash area was re-sprayed with a 100 gallon solution and one-half was re-sprayed with a 50 gallon solution. No difference was noted between the two rates of water used.

After spraying on March 10, approximately 1/2-inch of growth was noted in the interval between March 10 and March 17• After the March 17 spraying, growth was still maintained at the same rate of approximately 1/2-inch height growth per week. Without any spraying, growth would be about 1-inch per week during this period of the year with normal rainfall.

In summary, I would like to make the following observations:

1. Buckeye's first two spray applications were improperly applied. This resulted in excessive branching and mortality in the nursery and in the outplanting. Proof of this observation was found after receiving the brochures from the U. S. Rubber Company. They recommended using flat fan spray nozzles, tee jet series 8003 to 8006, mounted on 10 inch centers when applying MH-30T to grass with a boom-type sprayer.

2. The St. Regis spray applications were properly applied and their results further indicate this. The seedling terminal bud did not die and no streaking was reported. They have reported good survival of their slash and loblolly treated seedlings.

3. An application rate of MH-30T less than 1/2-gallon per acre is indicated by the browning and stiffening of the seed] ngs terminal at both nurseries.

4. High soil fertility and soil moisture reduce the growth retardant ability of MH-30T. This complicates the determination of a general, spray rate and application interval.

5. Seedling growth can best be retarded or stopped near the end of the growing season. Growth can be retarted, but not effectively stopped at the beginning of the growing season. Seedlings can be held over from one season to another without being too large to plant , but their quality at planting time is doubtful.

6. The effective use of growth retardants will require detailed tests under <u>all</u> growing conditions before they can become another tool in the growing of quality seedlings in our nurseries.

DISCUSSION TO: C. B. Davey and L. Mizell

Q. What would be the cost of growth retardants per thousand?
A. (Mizell) It depends on the number of applications. It costs $16 per gallon and a gallon is 3 pounds. Therefore, it costs about $8 - $8.50 per application per acre per million trees. This is roughly $0.03 per thousand.

COMMITS by Mr. Stafford:

We wouldn't recommend our procedure of using growth retardant other than on a trial, basis. The reason we sprayed the loblolly was because it got too tall for us and we were having to water this area because we had grafting stock material adjacent to it. The reason for spraying the slash pine was because we had some late planting coming up ahead, and we wanted to reduce the height growth. We also tried to undercut as well. In addition, although we had good survival, the seedlings don't look too well out in the field. Although the growth didn't actually stop, except on the loblolly in the nursery, in the terminal bud of the slash it showed signs of stopping. After it was outplanted it actually stopped growth. The terminal didn't die but is brown and stiff. A new terminal shoot took over and we had an ugly looking seedling .

Q. What was wrong with cutting the top off of them? Anybody try any of that?
A. (Mizell) Some thoughts have been given to the fact that more sprouts mean more wood - but to me, when you do something to affect the normal growth of man you are asking for all the possible diseases to come in and I think it works the same way with trees.

Q. Didn't you say you cut some of them off with a knife?
A. (Mizell) Yes, we did cut them off because they were getting up too tall and then sprayed them with retardant.

COL .ITS by Mr. Darby:

We cut one whole nursery off one year, which was primarily loblolly. They were getting a little large so we just run a roto-mower over the beds. Our good friend Floyd Cossitt recommended this so I tried it. Dr. May planted some of the seedlings but I don't know what happened to those as I didn't follow through on them, but I think he got good results. I think we could have gotten the same thing with root pruning, though.

COMMITS by Mr. Draper:

We used 1.1-1-30 and planted out a study up around Gray, Georgia. We showed a definite 15 percent loss in survival in the treated trees

as opposed to refrigerated trees. This is, of course, just one study. We had some trees left so we set up a study, although not very scientific. We planted 20 seedlings each of treated and untreated, and pinched out the buds in some and not in others. We could not find any correlation where pinching the buds helped, although I had read somewhere that this had been done.

Q. Did it cause any more forking or anything of that sort?
A. (Draper) I can't answer that as I had not noticed them since. The treatment was the importance of the test; however, we had noticed forking where we used 1N-30 before.

COMMENTS by Mr. Duffield:

One comment which relates to both the growth retardant and the root pruning subject. Several years ago I ran studies with Douglas-fir and noble fir following the Ed Stone root regeneration evaluation technique in the greenhouse. It was a study of seedling lifting in relation to root regeneration. We complicated the study by treating plants with growth retardants, maleic hydrazide and naphthalene acetic acid, which also acts as a growth retardant. These are applied to the tops. I'd like to point out that all of these substances have a profound effect not only on top growth but on root regeneration. That is something that you may not have evaluated in these testings. We were able to evaluate them very well in the greenhouse.

COMMENTS by Mr. Jordan:

Through contract with one company, we sprayed some seedllngs with maleic hydrazide. We had an even distribution of spray, but we got erratic results. The tops died but there was 3 to 4 inches of live stems and no dead roots. Some of the tops are completely dead, and with others, just the needles are dead. It is a growth stopper rather than a retardant.

COMMITS by Mr. Mizell:

The root pruning easily handles the growth and with the longleaf, we got much better survival. Where we don't get a success in root pruning, we don't get survival. This growth retardant has the possibilities of holding down the seedlings at the end of the season when we get heavy rains and with high densities, we get large seedlings.

Q.. Are they going to start growing again?
A. (Mizell) Yes, the ones planted in July are growing. However, a funny thing happened. I thought that those planted in the moist ground would do better than the others but this was not true.

Q. In comparison to the non-treated seedlings, have you just given these a temporary shot or are you going to have some sort of a lasting study?
A. (Mizell) 11e don't know.

COMMENTS by Mr. Duffield:

I can answer this about some of the true firs. In about 1955, We made MH-30 applications to about 6 species in the Nisqually Nursery. The purpose was to cut down the loss due to late autumn frost, which is a problem. We checked the growth early and saved the trees from frost damage. In Douglas-fir the trees died the following spring. In Monterey pine, they survived the winter as well. In the true firs, when they were checked, growth was about 2 weeks later resuming in the spring. Dy the end of the second year the growth was normal. Thus, the response varies with the species. There are some species or species dosage combinations where you get normal resumption.