LATE WINTER PRELIFTING FERTILIZATION OF LOBLOLLY SEEDBEDS

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During the 1955 planting season the Tallahatchie Research Center studied the effects of prelifting winter fertilization of nursery seedbeds on survival and early growth of normal loblolly seedlings planted on adverse sites in north Mississippi. The fertilizer amendment as applied in this study decreased first-year survival, but had no apparent effect on vigor or height growth.

The study was installed in cooperation with the Yazoo-Little Tallahatchie Flood Prevention Project and the Ashe Nursery at Brooklyn, Miss. The purpose was to explore promising leads obtained from unpublished planting studies conducted at North Carolina State College. Early results of the Carolina studies indicated that proper winter fertilization of normal and of yellow "chlorotic" loblolly pine seedlings, shortly prior to lifting, might improve vigor, survival, growth, and especially root development.

Design

The study included two morphological grades, large and small, of fertilized and unfertilized seedlings. Seedlings of either grade had a minimum root length of 5 inches, a minimum ground-line stem diameter of 1/8 inch, winter buds, and at least a few secondary needles. After outplanting, initial heights of large seedlings averaged 0.6 foot and of small seedlings, 0.4 foot.

Planting sites were: (1) eroded, loessial old fields, (2) eroded, sandy old fields, and (3) under a brushed and girdled overstory of ridge hardwoods. Two randomized blocks were established on each of three locations of each site condition. Each block included four plots, representing all possible combinations of the two grades and two fertilizer treatments. Each plot consisted of 25 test seedlings plus single-row isolation strips.

Procedure

A seedbed with normal loblolly stock, planted with seed from a single seed source, was selected for the study. One-half of each of three small, randomly selected plots within the bed was fertilized. A 2-foot isolation

strip separated the fertilized and unfertilized seedlings. A total of 160 pounds of N plus 200 pounds of K_2O per acre was applied, one-third on January 6, 1955, one-third on January 10, and one-third on January 14. The fertilizer was broadcast by hand and brushed from the foliage.

On February 15, one month after the last application of fertilizer, the seedlings were carefully lifted, packed in standard Forest Service bales, and shipped to Oxford, Miss. Upon receipt at Oxford the next day, they were immediately culled, graded, and repacked for shipment to the field. Approximately equal numbers of seedlings of a given grade from each of the three fertilized nursery plots were pooled to minimize any possible effect of site variation in the nursery bed; the same was done with unfertilized stock. Seedlings were planted during February 16-23.

While grading, it was observed that the fertilized seedlings had more fibrous roots. There was no discernible difference in color or appearance of the foliage, even, though a fertilized bed observed earlier at the nursery had shown a striking color contrast as compared to adjacent unfertilized beds.

Soil moisture during the growing season was generally favorable. August and September, however, were droughty months with rainfall less than half of normal.

Results

As recorded in mid-October 1955, first-year survival for all seedlings averaged 75 percent. Differences in first-year survival were tested by analysis of variance. Results of the survival analysis may be summarized as follows

1. There was no apparent difference in survival due to site.

2. There was no apparent advantage in using large as opposed to small planting stock.

3. Late seedbed fertilization in the nursery as applied in this study had a detrimental effect on seedling survival. Survival of fertilized trees averaged 69 percent while survival of unfertilized seedlings averaged 81 percent. Statistically, the differences are highly significant.

First-year height growth for all the study trees averaged 0.57 foot. Differences in first-year height growth were also tested by variance analysis, with these results:

1. Differences in height growth due to site were significant.

Height growth under a deadened overstory of ridge hardwoods was significantly better than on either of the old-field sites. Height growth averaged 0.67 foot on the released site and 0.52 foot on both the old-field sites.

2. Fertilization, independent of seedling grade, had no apparent effect on height growth.

3. The difference in height growth, independent of fertilization, between small and large stock was highly significant. Height growth averaged 0. 50 foot for small seedlings and 0.64 foot for large seedlings.

Discussion

On the basis of this limited test, prelifting winter fertilization of normal loblolly seedlings to improve field performance cannot be recommended. The one-level fertilizer treatment decreased survival, and did not improve vigor or height growth. This does not, however, discount the value of prelifting fertilization of unthrifty or chlorotic stock, as only normal seedlings were used in the test.

While the fertilizer in some way reduced survival, the effect of the fertilizer on the physiology of the seedlings was not evaluated. Developing superior physiological grades of seedlings (especially for planting adverse sites) through proper nursery amendments still holds considerable promise. There is need for more systematic trials combined with information on the physiology of seedlings through foliar analysis or other techniques.

With the criteria used in the study, "large" seedlings were primarily of standard morphological grade 1, while "small" seedlings were predominantly grade 2. Considering height growth alone, results indicate the desirability of planting the sturdier grade 1 stock on adverse sites.

In this study, first-year height growth of seedlings under a deadened overstory of ridge hardwoods was superior to that of seedlings planted in old fields. Survival, however, was not superior. This is contrary to the general belief that under north Mississippi conditions survival of seedlings planted under girdled ridge hardwoods is consistently better than survival on old fields.