EARLY RESULTS FROM A CHERRYBARK OAK IMPROVEMENT PROJECT

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Abstract. --At two cherrybark oak plantings in Tennessee and two in Arkansas, age-3 height of open-pollinated progeny varied significantly among families. Source differences were not significant in Arkansas. In Tennessee, progeny of the local trees were twice as tall as progeny of Arkansas and Mississippi trees. Progeny of phenotypically selected parents were significantly taller than the progeny from random parents at only one of four plantings. Survival of seedlings planted with bare roots or in milk cartons was significantly better than that of seedlings planted in paper tubes.

Additional keywords: Quercus falcata var. pagodaefolia, provenance, phenotypic selection.

Among southern oaks, cherrybark (Quercus falcata var. pagodaefolia Ell.) is a promising candidate for genetic improvement because it is the fastest growing and because it is found throughout the southern Coastal Plain and the lower Mississippi Valley. It grows best on well-drained, loamy soil where intensive forestry is expected. The study described here was undertaken jointly by the Southern Hardwoods Laboratory, the Tennessee Department of Conservation, and International Paper Company to determine whether there was sufficient genetic variation in the species to justify improvement efforts. Early results are promising.

METHODS

A total of 56 cherrybark oaks with above-average growth rates and straight boles free of surface abnormalities and epicormic branches were selected in natural stands in Tennessee, Mississippi, and Arkansas during fall in 1966 and 1967 (fig. 1). Form class and crown characteristics were also considered, but they were of secondary importance. Since trees were not assigned scores, the degree of superiority of the selections cannot be estimated. Emphasis was placed upon securing a large number of good trees rather than a few trees of extremely high quality. To judge the results of phenotypic selection, 39 additional trees were selected at random.

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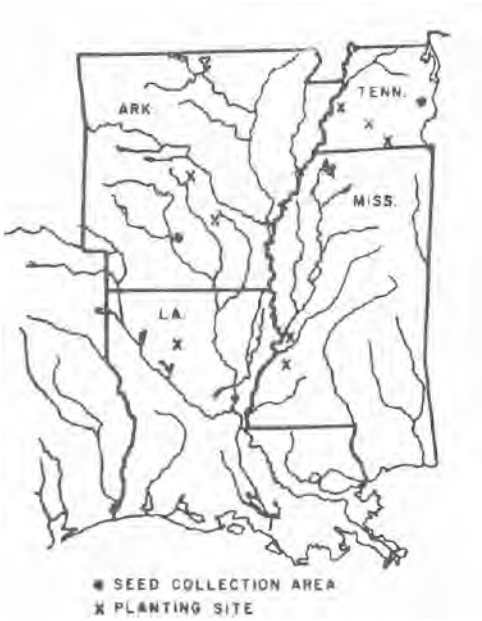

Figure 1.--Cherrybark oak seed collection areas and planting sites.

The acorn crop was scant in 1967, but sufficient numbers of acorns were obtained from 16 desirable and 16 randomly selected trees for progeny tests. In 1968 acorns were abundant, and they were collected from 56 desirable and 39 randomly selected trees.

Seedlings for plantings in Tennessee were grown at the Pinson nursery near Jackson, Tennessee. Those for Arkansas planting were grown at the Baucum nursery near Little Rock.

At the Pinson nursery, acorns were planted in nursery beds in early spring. At the Baucum nursery, they were planted in January in both nursery beds and containers. Here, 160 seeds from each family were sown in nursery beds, two seeds in each of 15 heavy cardboard mailing tubes (1.75 X 12 inches), and two seeds in each of 15 1-quart milk cartons (2.75 X 2.75 X 9 inches).

Seedlings were planted in randomized complete blocks at four locations, two near Lexington, Tennessee, with bare-rooted seedlings, and two near Fordyce, Arkansas, one with bare-rooted and the other with container stock (fig. I). Plots representing single open-pollinated families contained either three or four trees at 9 X 9-foot spacing. Plots with bare-rooted seedlings were replicated six to 10 times, and those with each type of container were replicated twice. A planting at Scarce Creek, Tennessee, was made in January 1969 with seedlings from 1967 acorns. The other locations were planted with seedlings from 1968 acorns.

Tennessee sites were old fields and soil was Collins silt loam. The Arkansas plantings were on well-drained floodplain soil in the Ochlockonee series which was cleared 2 years prior to planting and freshly disked just prior to planting.

Bare-rooted seedlings (1-0) were planted during the dormant season, and container seedlings (3 months old) in June. Competing vegetation was greatest in Arkansas and consisted mostly of blackberry and dewberry. Ground cover in Tennessee was primarily Johnson and Timothy grasses. All areas were disked once and mowed once the first year after planting.

In October 1969, 1-year height and survival were recorded at Scarce Creek, Tennessee. Equivalent height and survival were taken on the Arkansas plantings during the fall of 1970. Height and survival were again recorded at all plantings during June 1972. Analyses of variance were made and statistical significance was determined at the 0.05 level.

RESULTS AND DISCUSSION

Arkansas plantings.--At age 1 survival was 82 percent for bare-rooted seedlings, 85 percent for those in cartons, and 77 percent for those in tubes. Differences among the three types of planting stock were not significant. Heights were not affected by type of planting stock or source area. Although families differed significantly, select families showed no superiority over random families in either height or survival.

After 3 years, survival of bare-rooted seedlings and those in cartons was 66 percent, whereas that of seedlings in tubes was 50 percent. This difference was statistically significant. Height was not affected by type of planting stock or source area, and survival of bare-rooted seedlings was not influenced by source. At age 3, mean family heights differed significantly, ranging from 0.9 to 2.1 feet. Desirable and randomly selected families performed equally well.

Tennessee plantings.--Survival was excellent in both Tennessee plantings: 93 percent at age 3 at Scarce Creek and 92 percent at age 2 at Foster Trail.

At age 1, the average height of select families at Scarce Creek was 1.1 feet, while that of random families was 0.9 feet--significantly shorter. At age 3, heights of select and random families were still significantly different (2.6 vs. 2.2 feet), as were heights among the 17 families.

At Foster Trail at age 2, the tree heights averaged 2.0 feet. Trees from Tennessee sources were taller than those from Mississippi and Arkansas sources (2.3 vs. 1.2 feet). There were no differences between the select and random groups from either the Tennessee or the Mississippi and Arkansas sources. However, within the Tennessee select and random groups, family differences were significant.

The effect of provenance was observed in two plantings. In the one in Arkansas no effect was discernible. At Foster Trail, Tennessee, local progeny were twice as tall as those from Mississippi and Arkansas (2.3 vs. 1.6 feet). Eighty percent of the height variation among families in this planting was due to source differences.

The primary purpose of the study was to learn whether genetic variation among cherrybark oaks is sufficient to consider a tree improvement program. Results through age 3 are encouraging. Variations in height growth among families were large at all planting sites.

The results of selection were inconsistent. At only one planting site were progenies of desirable trees significantly taller than those of randomly selected trees. Since selection was not primarily for height growth, the lack of consistent gains in height growth is not very disappointing. The lack of consistency may indicate a complex relationship between site and early height growth.

Currently available data are insufficient to plan selection strategy For cherrybark oak. Santamour and Schreiner (1961) and Schreiner and Santamour (1961) in tests of five species of white and five of red oak Found frequent wide variations between progenies of two parents from the same locality. Kriebel (1965) found a strong effect of geographic origin on seedling growth rate, particularly when sampling a wide geographic distribution. Results of the present study indicate that both phenotypic and geographic selection may prove effective for cherrybark oak.

LITERATURE CITED

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