BLACK CHERRY SEED SOURCE STUDY IN NORTHERN ALABAMA - TEN YEAR RESULTS

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Abstract.-- In 1965 seed of black cherry (Prunus serotina Ehrh.) was collected from 47 individual trees in eight widespread geographic areas--four in Tennessee and one each in North Carolina, Virginia, Pennsylvania, and Michigan. Outplantings were established at two widely separated locations in 1967. Performance at these locations is not explainable on the basis of source latitude and altitude alone, suggesting that other adaptive factors are involved. Height and dbh differences were highly significant after eight years in southwestern Michigan and after ten years in northern Alabama. Frequency of black knot infection was not related to source but differences among genetic families were significant.

Additional keywords: Prunus serotina, racial variation, geographic variation, provenance.

Black cherry (Prunus serotina Ehrh.) is a sufficiently important cabinet wood that the trees are sometimes valuable enough to be sold on a single-tree rather than a per-acre basis. It grows rapidly enough that planting and manage-merit are economically feasible land use alternatives (Wright and Lemmien, 19r).

The natural range of black cherry covers almost all of the United States east of the Great Plains and includes small populations in Mexico and Central America. However, the commercial range is limited to the Allegheny and. Pocono Plateaus in Pennsylvania and adjacent areas in the Catskills and western New York. Although black cherry is not widespread in the southern Appalachians, high-quality trees are fairly frequent at higher elevations. Both quantity and quality of black cherry trees are much lower at the lower elevations of east Tennessee (lower than 2,000 feet) and on the Cumberland Plateau. This test was established to:

1. Determine the best source for black cherry seed suitable for planting at lower elevations in the Tennessee Valley.

2. Compare seedlings, and eventually trees, from various black cherry sources to see if either latitudinal or altitudinal races exist.

3. Observe morphological differences among sources and among trees within sources to determine the extent of the genetic variation for selected characte

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This progress report presents a comparison of two provenance test plantations established in 1967 in southwestern Michigan and northern Alabama. The work of Jonathan W. Wright at the W. K. Kellogg Forest in Michigan is gratefully acknowledged.

MATERIALS

Seed was collected in 1965 from 47 individual trees located in eight widespread areas (Table 1). In most areas, an attempt was made to collect the seed from better-than-average trees located in a single timber stand. Since this was not always possible, only four of the Monroe County, Tennessee, trees were in the same stand; the remaining four were scattered but were growing at about the same elevation. All eight Pennsylvania trees from which seed was selected were in different stands.

Table 1.--Seed weights, altitudes, and sources per provenance for eight black cherry seed sources.

No. trees	Place of origin state, county	Latitude (County Seat)	Altitude feet/meters	Seed Per oz./gram	1-0 Seedling Ht. ft./cm.
6	TN, Anderson	36.06°N	800/ 243	482/17	2.01/61
4	TN, Giles	35.12°N	900/ 274	482/17	2.43/74
6	TN, Franklin	35.10°N	1,900/ 579	494/18	1.87/57
8	TN, Monroe	35.31°N	3,800/1,158	260/ 9	2.48/76
6	VA, Wise	36.56°N	4,000/1,219	292/10	1.78/54
2	NC, Macon	35.11N	3,800/1,158	283/10	2.32/71
7	MI, Cass	42.17◦N	700/ 213	295/10	2.47/75
8	PA, Cambia & Elk	40.29°N 41.20°N	2,000/ 610	288/10	2.27/69

METHODS

Both Michigan and Alabama test plantations were established in the spring of 1967 with 1-0 stock grown from seed at Norris, Tennessee. The Michigan planting (four replications, 10-tree plots) was established by Jonathan Wright on the W. K. Kellogg Forest near Battle Creek, in southwestern Michigan. The Alabama planting (12 replications, 20-tree plots) was established by Kingsley A.Taft, Jr., near Florence, in northwestern Alabama. Three other plantings established were not sufficiently intact by age 10 to warrant measurement and are, therefore, not included herein.

Plantings were established in the "compact family block" design, in which offspring of all parents in the same stand are grouped together. Wright and Lemmien (1972) have described the seven-year results of work at the Michigan plantation (six years in the field). An additional two years of field data are included in this report.

RESULTS

Michigan

Major results from the Michigan planting are presented in Table 2. It should be noted that this represents eight years in the field, since 10-year data were not available. As a result, performance at the two locations will not be directly comparable, but relative performance can be noted at the two locations.

At planting and after the second year, trees from North Carolina seed were the tallest and Virginia trees were shortest (Wright and Le MI fen, 1972). All altitudinal relationship was noted by Farmer and Barnett (1972), which indicated a trend of larger black cherry seed with increasing source altitude and probably as a result, larger seedlings, The larger seedling size of Michigan and Pennsylvania trees is explainable on the basis of latitude (Table 1) . Poor nursery performance by Virginia sources is an exception to this general observation; however, as will be noted, Virginia trees performed poorly throughout the life of the plantings in both locations.

Michigan trees were taller than all other sources at the Michigan site. However, Monroe County, Tennessee, source trees were taller than all remaining sources (the Giles County, Tennessee, source was not included in this planting). There was no difference in height among trees of the remaining five sources.

Michigan trees were larger in dbh than all sources except the Monroe County, Tennessee, trees. Monroe County, Tennessee, trees were larger than Macon County, North Carolina, trees, but there was no difference between Monroe County trees and the remaining four sources.

Table 2.--Eight and ten year performance of black cherry grown in Michigan and Alabama from seed collected in varying latitudes and altitudes.

No. families (trees)		Seed Origin		8-10-year[a] stock characteristics				Black Knot Infected
		State	County	Height (m)		DBH (cm)		(percent)
MI	AL			MI	AL	MI	AL	AL
6	5	TN,	Anderson	4.4	6.5	4.2	5.6	0.8
0	2	TN,	Giles	-	6.3	-	6.1	5.5
6	6	TN,	Franklin	4.4	5.9	4.1	4.8	11.6
7	8	TN,	Monroe	5.2	4.6	4.8	3.8	3.2
4	3	VA,	Wise	4.3	3.5	4.2	2.5	2.4
1	1	NC,	Macon	4.3	4.0	3.4	2.8	4.5
7	5	MI,	Cass	5.6	5.8	5.8	5.3	6.9
2	3	PA,	Cambia & Elk	4.2	4.9	3.9	4.3	9.9
		F Value		11.4*	16.54*	6.8*	13.22*	1.90 N.S.

a. Michigan trees grown for 8 years in field; Alabama trees, 10 years.
*Significant at the I percent l*evel.*

Alabama

Major 10-year results of the northern Alabama planting are found in Table 2.

This planting *was to* consist of twelve 20-tree plots, but not enough seedlings were available to establish every family in every plot. In addition, because of heavy mortality due to poor drainage and honeysuckle and other competition, additional families were eliminated from some plots. As a result, only three replications included all eight sources by age 10. Analyses upon which this report is based were made on data from those replications. Other analyses were performed, which included more replications and fewer families, but no differences were observed in relative mean rankings.

The plantation had been established on a spacing of four feet in rows and 10 feet between rows. After the ninth growing season, it was marked and thinned to provide space for growth. Trees were left on the basis of height, diameter, and lack of black knot [Dibotryon morbosum (Schw.) T. and S.] infection. Five-year height data were analyzed again using data from trees left after thinning, so that all analyses are based on the same trees.

At planting and at two years in the field, North Carolina and Monroe County, Tennessee, trees were larger than trees from the remaining six areas but not significantly so. By five years, however, the Giles County, Tennessee, trees were tallest, and trees from the Michigan source were second tallest. North Carolina and Virginia trees were smallest after five years in the field.

Trees from Anderson County, Tennessee, were among the shortest when planted and after two years in the field, were fourth tallest after five years, and the tallest after ten years. However, there was no difference among trees in Anderson County, Tennessee; Giles County, Tennessee; Franklin County, Tennessee; and Michigan. Trees from North Carolina and Monroe County, Tennessee, which. were tallest as 1-0 seedlings and after two years in the field, were only slightly taller than Virginia trees at 10 years. Virginia trees were shortest. Significantly, all three shortest trees are from southern high elevation sources and from seed and stock planted on low elevation sites.

Performance in dbh was similar to height growth. The top four sources in order of best performance were Giles County, Tennessee; Anderson County, Tennessee; Franklin County, Tennessee; and Michigan. Again, Monroe County, Tennessee; North Carolina; and Virginia were smallest in diameter, respectively.

Black knot is a disease which occurs on cherry and plum trees in orchards and also attacks wild species. On black cherry, large cankerous swellings two or more feet long occur on the trunks of large trees, and where such lesions are scattered along the bole, the tree is worthless (Boyce, 1961).

A large number of the trees in the Alabama planting were infected when thinned. These trees were removed, but the number of infected trees was recorded and the percentage infection was analyzed after transforming to arc sin $\sqrt{\text{percentage}}$. Although the range of variation among sources was wide, there was no difference in infection incidence among sources. There was, however, a significant difference among families.

DISCUSSION

In their earlier report on the Michigan planting, Wright and Lemmien (1972) noted that Michigan trees were most adaptable, growing nearly as well on knolls as in low areas. Performance in northern Alabama confirms this adaptability, since there was no height or diameter difference between Michigan trees and their low elevation southern counterparts.

Conversely, in Michigan after eight years, trees from the high elevation Monroe County, Tennessee, sources, while smaller in height and diameter than the local Michigan trees, were larger than more northerly sources and other high elevation southern sources.

In general, as would be expected, trees from the southerly, low elevation sources did better in the southern planting (with the exception of Michigan trees), and high elevation southerly sources performed better in the northern planting. Some of the trees from the southern high elevation sources were taller in Michigan after eight years than in Alabama after 10 years (Table 2).

As Wright and Lemmien (1972) suggest selections for growth apparently can be made from provenances. No significant growth differences were noted among families within sources.

In contrast to the situation with height and dbh, resistance to black knot appears to lend itself to breeding on an individual tree basis, with no difference noted among widespread sources.

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