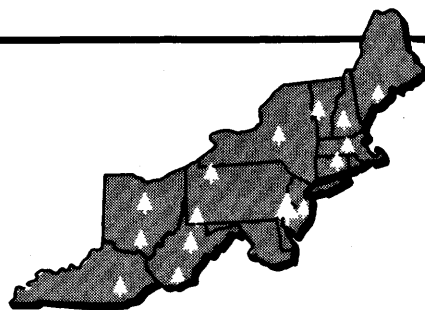


1974

Northeastern Forest Experiment Station



FOREST SERVICE, U.S. DEPT. OF AGRICULTURE, 6816 MARKET STREET, UPPER DARBY, PA. 19082

LOCAL SOURCES OF BLACK WALNUT RECOMMENDED FOR PLANTING IN MARYLAND

Abstract.—After 5 years, local black walnut seedlings were taller than those of 12 out-of-state sources in a Maryland planting. Seedlings from south-of-local sources outgrew trees from northern sources. Genetic influence on height was expressed early—with little change in ranking of sources after the third year.

Black walnut (*Juglans nigra* L.) trees are being planted in many parts of Maryland and adjoining states. The question has been: what are the best seed sources for plantings in this area? Results of this study indicate that stock from local seed sources is best for planting in Maryland, and that, if local seed supplies are insufficient, seed should be obtained from areas south of Maryland.

Methods

Seedlings were raised in two different nurseries: those of the local Maryland source were raised in the nursery of the Maryland Forest Service; those of the other 12 sources were raised in the Union Tree Nursery in southern Illinois. For the seedlings of each source, seed was collected from about eight parent trees.

When planted in Maryland, the 1-0 seedlings from the Illinois nursery were about 18 inches tall (average height by stocks varied from 10 to 25 inches) and had strong taproots with few lateral roots. They were planted in auger holes

(11 inches in diameter) on 15 April 1968. In contrast, seedlings from the Maryland nursery were about 11 inches tall and had many lateral roots; they were planted in holes dug with shovels on 16 April 1968.

For this study, 24 seedlings of each source were planted: a four-tree plot in each of six blocks. Sources were arranged randomly within blocks. Spacing of trees was 12 x 12 feet. Around most of the study area, an isolation strip was planted to black walnut seedlings from the Maryland nursery.

The planting is in a former field in the Gunpowder State Park (latitude 39°29' N, longitude 76°25' W) at an elevation of 220 feet. The site is about 10 feet above the nearby stream. Two floodplain soils occur in the area: Codorus (formerly Chewacla) and Hatboro (formerly Wehadkee) silt loams. Natural drainage of the Codorus is better than that of the Hatboro soil.

Before planting, the ground was prepared by rototilling in 6-foot strips. Weeds were controlled annually with atrazine, simazine, rototilling, and hoeing in various combinations.

The degree of weed control varied from fair during the first 2 years to excellent in the last 3 years.

Corrective pruning (Krajicek and Bey 1969), a technique for developing straight central stems, was performed annually. Only a small amount of pruning was done each year, except in 1971. Because of late frosts in 1968 and 1970, many stems had severe crooks in 1971. If a crook deviated more than 10 inches from the central stem axis, the tree was coppiced at 1 inch above ground. About 25 percent of the trees (by sources 9 to 38 percent) were coppiced in 1971.

Results

Survival was good for all sources throughout the 5-year period (table 1). Ninety-six percent of the trees were alive at the end of the third year. Then, heavy rains during the next 2 years and a clogged drainage ditch produced excess water on part of the site; and survival was reduced to 78 percent. After 5 years, survival by source ranged from 62 to 88 percent; and there was no apparent geographic trend.

After 5 years, trees from southern sources were generally taller than trees from northern sources (table 1). The correlation between

1972 height of all trees (including coppiced stems) and latitude of origin was significant. Fifty-eight percent of the height variation among sources was accounted for by latitude of source. In contrast, the effect of longitude on variation among sources was negligible.

Coppicing had little effect on average height and relative ranking among sources (table 1). As might be expected, sprouts grew so rapidly that in three of the sources with relatively short trees, average height of all trees (including coppiced stems) was the same or more than the average height of stems excluding sprouts.

The Maryland source trees, grown in a separate nursery, were next to the shortest at planting time. In the first 2 years, they advanced from 12th to 8th in ranking for total height, in the third year to 4th, and in the fourth year to 1st. Even though there were differences in nursery and methods of digging planting holes, their effect in favoring the Maryland source trees is questionable.

The steady advancement in rank of the locally grown stock from local seed apparently indicates that it is genetically better adapted to Maryland conditions than trees from out-of-state sources. Because Maryland trees were tallest after 5 years, use of local seed sources for plantings within the State is encouraged.

Table 1.—Location, average height, and survival by seed source

Source number	State	Location		Average height ¹ at end of—			Survival in fifth year ²
		Latitude; North	Longitude; West	First year	Third year	Fifth year	
		Degrees	Degrees	Ft.	Ft.	Ft.	%
—	Md.	39°18'	76-77°	1.1	4.6	48.9(9.4)	83
5,891	Va.	36°50'	78°45'	2.2	5.0	8.7(9.1)	83
5,893	Ill.	37°50'	89°30'	1.9	5.2	8.5(9.4)	88
5,872	Mo.	37°09'	93°49'	2.2	4.7	8.1(8.3)	83
5,873	Mo.	37°37'	91°25'	1.3	4.3	8.0(8.3)	67
5,876	W. Va.	37°56'	80°16'	1.7	4.3	7.9(8.9)	75
5,868	Ohio	40°45'	81°55'	1.8	4.2	7.6(7.8)	79
5,877	Mo.	39°45'	94°35'	1.9	4.2	7.5(7.2)	88
5,875	Mich.	42°14'	85°14'	1.6	4.2	7.1(7.4)	67
5,879	Mich.	42°33'	84°31'	1.2	3.9	7.1(7.1)	67
5,966	Neb.	40°46'	95°48'	1.0	4.1	7.0(7.0)	88
5,895	Pa.	40°52'	77°18'	1.4	3.9	6.5(7.0)	62
5,896	Ohio	41°10'	80°45'	1.3	3.8	6.4(6.9)	83

¹Of living trees in year shown.

²Including coppiced trees.

³Estimated; actual values are unknown for the Maryland stock.

⁴Values in parentheses exclude coppiced trees. Differences greater than 1.6 (1.8) feet are statistically significant.

Source influence on relative height at 5 years was evident by age 3. Correlation coefficients for heights at age 5 versus ages 1, 2, 3, and 4 were 0.46, 0.66, 0.87, and 0.89 respectively. The Maryland source was included in this analysis. In such analysis, correlation values naturally increase as the period decreases. Even so, both the correlation analysis and the data (table 1) indicate that the tallest and shortest third of the sources at 5 years could have been selected with high reliability after two or three growing seasons in the field.

These early results suggest that if Maryland seed supplies are inadequate, the needed seed should be obtained in areas *south* of Maryland. The southernmost source in this test was at a distance of almost 200 miles. This and other tests indicate that winter hardiness is not usually a problem within a 200-mile zone. However, in case of variability in hardiness, we suggest that: (1) in the absence of enough local seed, obtain seed only from within a 200-mile zone; and (2) mix

seed so that seedlings varying in winter hardiness or rate of growth are mixed in all lots. Sources of seed from north of the state, or appreciably north of the planting site, should be avoided.

References

- Bey, C. F.
1973. GROWTH OF BLACK WALNUT TREES IN EIGHT MIDWESTERN STATES—A PROVENANCE TEST. USDA Forest Serv. Res. Pap. NC-91. N. Cent. Forest Exp. Sta. 7 p. St. Paul, Minn.
- Krajicek, John E., and Calvin F. Bey.
1969. HOW TO "TRAIN" BLACK WALNUT SEEDLINGS. USDA Forest Serv. N. Cent. Forest Exp. Sta. 5 p. St. Paul, Minn.

—SILAS LITTLE*
CALVIN F. BEY
DANIEL McCONAUGHY

*Silas Little is Project Leader, USDA Forest Service, Northeastern Forest Experiment Station, Pennington, N. J.; Calvin F. Bey is Principal Plant Geneticist, USDA Forest Service, North Central Forest Experiment Station, Carbondale, Ill.; and Daniel McConaughy is Project Forester, Maryland Forest Service, Bel Air.

Acknowledgment.—This study was initiated by the North Central Forest Experiment Station. The Maryland planting was made, tended, and measured cooperatively by the Maryland Forest Service and the Northeastern Forest Experiment Station.
