

Black Walnut Progeny Study: A Progress Report

by

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Black walnut (*Juglans nigra* L.) timber varies more in value and quality than any other hardwood species native to the Central States. While much of the quality variation can be attributed to environment, there is little doubt that part of the variation is due to inherent characteristics. In 1961 a study was undertaken by the Central States Forest Experiment Station of the U.S. Forest Service to find black walnut trees that will produce superior seedlings for planting in various regions within the commercial range of the species. This is a one-parent progeny study and the primary criterion for selection is the suitability of the parent tree for the potential production of high-quality veneer. The only other study of black walnut seed source for timber production that we know of was the one begun by Wright¹ in 1945. However, this provenance study has been discontinued due to poor initial survival and growth.

The potential value of high-quality black walnut timber is well known to most landowners. Walnut has been a favored species for wood and nuts since colonial times. Consequently, this species has been consciously or unconsciously favored in the forest and in the pasture for many years. Because it is a valuable tree and a favorite of both the forester and the farmer, genetically superior planting stock should be readily accepted when available.

Since Indiana is the center of high-quality black walnut production and utilization, primary responsibility for the study was assigned to the Bedford research center of the Central States Forest Experiment Station. However, the study is in all respects a regional undertaking by the Forest Management Division of the Experiment Station. The work plan was a joint effort of F. Bryan Clark, Gustaf A. Limstrom, and Stephen G. Boyce. Outplantings will be made by four different research centers. So far, seed has been collected in eight different states with the aid of various forestry agencies and the walnut industry. The Indiana State Division of Forestry is producing the seedlings at its Jasper-Pulaski Nursery and the American Walnut Manufacturers' Association is giving the study financial support.

STUDY DESIGN

The study is designed for a total of 40 individual selections. The Experiment

¹Wright, J. W. 1954. Preliminary report on a study of races of black walnut. Jour. Forestry 52:673-675.

Station research centers in Kentucky, Missouri, Iowa, and Indiana will establish complete plantings of all selections. A sample unit of each selection is four trees; each selection will be replicated five times at each location. In other words, 20 trees from each of 40 selections will be planted at each location. Study trees will be planted on an 8- by 16-foot spacing. Red oak (*Quercus rubra* L.) filler trees will be planted between the 16-foot rows. Each study area and the necessary isolation strips cover about five acres. The planting sites will be clear-cut forest land judged capable of producing high-quality black walnut timber. All trees will be felled and the understory poisoned. Weed and sprout competition will be a serious problem on these good sites and during the first few years it may be necessary to release the planted trees several times.

SELECTION OF THE TREES

Parent trees have been located by means of the Experiment Station "Report of Promising or Unusual Stands or Trees." A supply of reports was sent to state and federal forestry agencies and to wood-using industries with a special plea for information on black walnut. Through these reports and personal contacts about 75 trees were located as potential selections. Station research foresters evaluated the potential study trees in their working areas. A surprisingly large number of trees did not qualify as select trees. Even though we were careful to define outstanding trees to our cooperators, the concept of phenotypically superior trees is evidently difficult to get across. Some foresters and log buyers believe that a large tree is a superior tree because it is worth more in dollars. Some seed was sent from poorly formed trees, but will not be used. Many qualified trees produced no seed in 1961 and it is already apparent that some of these same trees will not have an adequate seed crop in 1962.

HANDLING OF THE SEED

To produce the required 80 seedlings per selection suitable for planting we have tried to get at least 300 seeds from each study tree. Black walnut fruitfulness is extremely variable and it is not always possible to get 300 seeds from forest-grown trees. The problem is further complicated by variation in viability and germination. All collections are hulled by lots and sown in the fall under mulch. The beds are protected by 1/4-inch-mesh hardware cloth to eliminate pilferage by squirrels. Twenty-five seedlots were collected and sown in the fall of 1961 but only 14 lots produced enough seedlings for complete planting at all locations. Re-collections will be made where insufficient seedlings were produced.

PREPARING THE PLANTING SITES

Site preparation is a big job that started well in advance of the actual planting. Finding a suitable, uniform area is difficult. All of the outplantings will be made on public lands, and this qualification created some difficulties. For example, public land in Indiana is concentrated in the southern part of the State but walnut grows best in the north. Through the cooperation of the State Forestry Division, an excellent planting site was located on a small State Forest. Here it will be necessary to harvest some young sawtimber prematurely and to kill some high-quality poletimber.

This may distress administrating foresters and confuse the sawmiller, but the few hundred dollars that are sacrificed now will be a drop in the bucket compared with the potential return from this work. Understory vegetation has been treated on most of the planting sites. Low cover was foliage-sprayed during the growing season. Saplings, poles, and cull sawtimber trees will be felled and the stumps sprayed with herbicides to reduce sprouting. Stumps of sawtimber trees that are likely to sprout will also be sprayed. Logging will be done in the dormant season and some tops will have to be lopped and scattered.

PRESERVING THE SELECTIONS

A tag bearing the tree number and the statement, "Before cutting contact U.S. Forest Service, Old Federal Building, Columbus 15, Ohio" is attached below stump height on each selection. We have already had occasion to try to preserve several study trees vegetatively. Scionwood was collected from harvested study trees and stored according to recommended procedures. Unfortunately, the scionwood deteriorated badly in storage. Several hundred grafts were made but almost all of them failed. While propagation by grafting is commonplace for nut culturists, we are faced with the possibility of having to preserve scionwood for long periods. If techniques can be developed it may be more efficient to root cuttings or graft buds depending upon the time of year the trees are cut.

WORK AHEAD

The 1-0 planting stock now in the nursery will be lifted and planted in all four locations in the spring of 1963. Less than half of the needed selections have been made. A small backlog of good trees that did not produce a seed crop in 1961 may provide seed in 1962. We are continuing to seek help in locating more select trees, particularly in areas that are not represented in the present collections.

Tentatively, we plan to use surplus stock from select sources to establish seed orchards in Indiana. A precise record of sources of the orchard trees will be maintained and information on the performance of progeny trees in the main study will aid in the management of the seed orchards. Trees found to have undesirable features in the progeny study will be rogued out of the orchard plantings.

Since walnut is dichogamous, it may be possible in the future to compare preserved clonal material with the open-pollinated seedlings of the progeny study in order to evaluate the heritability of various characteristics of the mother trees.

We are grateful for the fine cooperation we have received from industry and the many forestry agencies throughout the range of walnut. The Black Walnut Progeny Study is an outstanding example of the cooperation needed to undertake such long-term research. Without cooperation, the costs to one particular agency would be prohibitive.