

ANNOTATED BLACK WALNUT LITERATURE

by J.W. "Jerry" Van Sambeek, Education Committee Chair and Research Plant Physiologist

USDA Forest Service, North Central Research Station; 202 Natural Resource Building, University of Missouri; Columbia, MO 65211-7260

Many of our publications on the establishment, management, and utilization of black walnut, butternut, and associated high-value hardwoods are printed in conference proceedings or scientific journals that are not readily available at most public libraries or on the internet. As Chair of the Education Committee, I have tried to summarize for you the relevant findings of the following technical articles or books and, if available, where to download the full text or write for reprints. As an additional service, I have placed copies of these materials in the Walnut Council Library maintained by the Education Committee. These materials can be borrowed from the Education Committee for two weeks by sending a written request to the above address or an email to jvansambeek@fs.fed.us.

IMPACTS OF INTENSIVE MANAGEMENT ON BLACK WALNUT (*JUGLANS NIGRA* L.) GROWTH AND BOLE QUALITY AT MID-ROTATION

by James R. Bohanek and John W. Groninger in *Forest Science* (2003) 49(4): 522-529.

The paper examines whether recommended treatments applied to young black walnut plantings to increase diameter growth will be judged as successful in midrotation for stem or bole quality. The authors evaluated how planting density, interplanting with nitrogen-fixing European black alder, post-establishment weed control, and time of thinning influenced growth and bole quality of a 35-year-old walnut planting in south-central Illinois. Walnut was established on a 26- x 26-foot low density spacing with and without alder on a 13- x 13-foot spacing and a high density spacing of walnut on a 18- x 18-foot spacing and alter on a 9- x 9-foot spacing. Walnut stem diameter was least for the high density spacing (8.7 inches) with no differences between the walnut in the low density plantings with and without alder (10.5 and 11.1 inches, respectively). All trees had been repeatedly disked for the first three years and mowed twice a year the next two years before each plot was divided in half and one half treated with herbicides for two years. Post-establishment weed control as 8-foot diameter circles using various combinations of 2,4-D amine, dalpon, atrazine, and simazine did not increase diameter growth but did result in a higher incidence of frost cracks and other grade defects in the butt log (first 8 feet).

PHYSIOLOGICAL AND ULTRASTRUCTURAL CHANGES IN BLACK WALNUT EMBRYOS DURING STRATIFICATION AND GERMINATION

by Peter W. Somers and J.W. Van Sambeek in the *Annual Report of the Northern Nut Growers Association* (2003) 94: 107-119.

It is well documented that black walnut requires 90 to 120 days of cold moist stratification before seed will germinate. The authors periodically examined the changes that occurred in seed chemistry and anatomy during stratification. A previous report indicated dropping temperatures in the fall induced a rapid rise in abscisic acid, a hormonal that causes seed to go into deep dormancy. Near the end of dormancy, concentrations of this hormone decreased while that of gibberellic acid, a hormone associated with germination and shoot elongation, increased. Authors found that seed show a low rate of oxygen consumption during stratification with a slight increase in oxygen consumption entering dormancy and a marked

increase in oxygen consumption during germination. This may explain why seed must be over-wintered in well-drained pits or in oxygen permeable plastic bags because stratification does not proceed without oxygen. Seed uses oxygen to generate energy-rich compounds like ATP. The energy in these compounds is used to carry out chemical reactions necessary for respiration and growth. The amount of ATP is quantified as the adenylate energy charge. Adenylate energy charge was lowest when seed was in deep dormancy and increased as seed went through stratification and germination. Probably the findings of greatest interest are a series of photographs showing the changes that occur in the cells of the embryo from which the seedling will emerge. Cells in embryos in freshly fallen seed are filled with storage materials (lipids and proteins), show little activity in the chromatin of the nucleus, and lack many of the structures found in green plants. After 30 days of cold stratification, the embryos showed a reduction in stored lipids and proteins and some expanded chromatin. The later maybe an indication of production of genetic information needed for production of new proteins and enzymes. After 90 days of stratification, vacuoles similar to those found in most plant cells are now present and membranes associated with synthesis of proteins and enzymes are visible next to the nucleus. Cells at this point contain many of the structures found in actively growing plants. With extended stratification to 180 days, a number of structures associated with normal cellular functions are visible and the vacuoles have condensed to a single large vacuole containing precipitated phenolic compounds. The rapid formation of cell structures found in actively growing plants are consistent with the observed increase in oxygen consumption and adenylate energy charge within the embryo during stratification.

BLACK WALNUT CULTIVAR PERFORMANCE PROJECT

by Bill Hanson in the *Annual Report of the Northern Nut Growers Association* (2003) 94: 120-132.

The Iowa Nut Growers Association initiated a project in 2001 to answer the question "What cultivar(s) should I plant for commercial nut production?" The Black Walnut Cultivar Performance Project was set up to evaluate 18 cultivars for nut production in Iowa. Scionwood of these cultivars are being grafted and planted at 54 privately owned sites. Each site is planted with 9 or 12 trees that include an early, mid, and late ripening cultivar. Early results suggest that beginning grafters should try to graft *Rowher* or *Surprise*, two easy to graft cultivars, to seedling rootstocks of *Kiwk Krop* or *Sparrow*. Other recommends include grafting precocious cultivars, such as *Kwik Krop* or *Sparks 127*, to non-precious cultivars such as *Sparrow* or *Eldora*. Apparently some cultivars, such as *Sparks 127*, show rapid initial growth followed by notoriously slow growth once they start producing nuts. The early maturing cultivars being evaluated include *Sparks 127*, *Eldora*, *Kitty*, and *Cochrane*. The mid-season ripening cultivars include *Kwik Krop*, *Sparks 129*, *Sparks 147*, *Clermont*, *Bowser*, *Surprise*, *Sauber #1*, *Emma K*, and *Beck*. The late maturing cultivars include *Rowher*, *Crantz*, *Oldham*, *G-4*, and *Hay*. To maintain maximum early growth and foliage, the project does not recommend early pruning of forked trees. They recommend pinching off the growing tips two to three times a year on the branch on the down wind and removal only after the branch reaches 1 inch in diameter.

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NEW PLANTATION MANAGEMENT PUBLICATIONS AVAILABLE

The Hardwood Tree Improvement and Regeneration Center at Purdue University and Purdue's Department of Forestry and Natural Resources have developed a set of publications entitled "The Planting and Care of Fine Hardwood Seedlings." There are currently 9 publications in the series covering a broad range of topics in hardwood plantation management.

These 4-color publications are available to download free of charge at <http://www.ces.purdue.edu/extmedia/fnr.htm>. Paper copies may be ordered for \$2 each by calling Purdue's Media Distribution Center at 1-888-398-4636 or by email at media.order@purdue.edu. The publications include:

Native Hardwood Trees of the Central Hardwood Region, FNR-218 Paula Pijut, North Central Research Station, USDA Forest Service, Department of Forestry and Natural Resources, Purdue University, 2005.

This publication is intended to provide the landowner, interested in planting hardwood trees, with a list of native hardwood trees of the central hardwood region and their basic natural growing environment.

Environmental and Management Injury in Hardwood Tree Plantations, FNR-217 John Seifert, Department of Forestry and Natural Resources, Purdue University and Keith Woeste, North Central Research Station, USDA Forest Service, 2005.

The injuries described in this publication sometimes mimic those caused by animals, insects, and diseases. Some environmental and management related injuries can be treated, but it is best to prevent their occurrence.

Diagnosing and Controlling Wildlife Damage in Hardwood Plantations, FNR-216 James McKenna and Keith Woeste, North

Central Research Station, USDA Forest Service, Department of Forestry and Natural Resources, Purdue University, 2005.

Once trees are planted and begin growing, damage from wildlife can threaten their quality. In this publication we discuss how to identify and manage injury to hardwoods from wildlife to minimize losses.

Fertilizing, Pruning, and Thinning Hardwood Plantations, FNR-215

James McKenna and Keith Woeste, North Central Research Station, USDA Forest Service, Department of Forestry and Natural Resources, Purdue University, 2004.

Financial and Tax Aspects of Tree Planting, FNR-214

William L. Hoover, Department of Forestry and Natural Resources, Purdue University, 2004.

Designing Hardwood Tree Plantings for Wildlife, FNR-213

Brian J. MacGowan, Department of Forestry and Natural Resources, Purdue University, 2003.

Nursery Production of Hardwood Seedlings, FNR-212

Douglass F. Jacobs, Department of Forestry and Natural Resources, Purdue University, 2003.

Regenerating Hardwoods in the Central Hardwood Region: Soils, FNR-211

Felix Ponder, Jr., North Central Research Station, USDA Forest Service, Lincoln University, and Phillip E. Pope, Department of Forestry and Natural Resources, Purdue University, 2003.

Planting Hardwood Seedlings in the Central Hardwood Region, FNR-210

Paula M. Pijut, North Central Research Station, USDA Forest Service, Department of Forestry and Natural Resources, Purdue University, 2003.

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RESULTS ON THE ESTABLISHMENT OF NAMED VARIETIES OF EASTERN BLACK WALNUTS ON AN UPLAND SITE IN THE OUACHITA REGION OF ARKANSAS

by David Brauer and Jim Jones in the Annual Report of the Northern Nut Growers Association (2003) 94: 133-145.

Little is known about which named nut-producing cultivars will perform well along the southern edge of the walnut region or, specifically, in the Ouachita region of Arkansas. The authors established a small black walnut cultivar trial in fall 1999 near Booneville, Arkansas using scionwood from eight named cultivars grafted to seedling rootstocks grown as RPM seedlings from seed of seven cultivars. Scionwood was not replicated across all rootstocks so it is difficult to evaluate what effects rootstocks are having on scion growth, flowering, and nut production. Highest survival of grafts after three growing seasons were *Sauber* on *Thomas*, *Thomas* on *Thomas*, and *HPC 148* on *Sparrow* rootstocks. Although *Kwik Krop* had low survival, it had the tallest grafts (9 feet at age 3) followed by *Sauber* on *Thomas*, *Thomas* on *Thomas* and *Surprise* on *Purdue #1*. Trees are planted in a Bermuda grass sod managed for hay with a split application of 500 pounds of nitrogen annually. Over half of the grafts for all combinations produced flowers in the third growing season and all grafts except *Sparrow* on *Emma K* or *Thomas* rootstocks matured 1 to 10 nuts per tree. Highest early nut production was with *Sauber* on *Thomas* rootstocks. The cultivar *HPC 148* consistently had the earliest budburst and latest leaf drop for three growing seasons. In contrast, none of the other seven cultivars consistently had the latest budburst or earliest leaf fall. Because of expected soil moisture deficits in late summer, newly planted grafts

were irrigated with 6 or 12 gallons of water every five days. The higher rate resulted in a water-saturated subsoil and high mortality of grafts. Effects continued into the second growing season when fewer than 30% of grafts survived compared to more than 80% of the grafts in the low irrigation treatment.

SCION AND ROOTSTOCK AFFECT ON THE PERFORMANCE OF GRAFTED BLACK WALNUT CULTIVARS by Mark V. Coggeshall, Andrew L. Thomas, and J.W. Van Sambeek in the Combined Proceedings International Plant Propagators' Society (2003) 53: 555-557.

Scionwood of five black walnut cultivars were grafted to seedling rootstocks grown from seed collected from three cultivars or mixed parentage. The reason seed from known cultivars was used to produce seedling rootstock is because large quantities of seed are available for commercial production of superior rootstocks if rootstocks are shown to affect nut production. Grafts were planted in the southwest corner and central Missouri to evaluate rootstock effects on survival, growth, precocity, and nut production. Scionwood grafted to *Kwik Krop* and *Thomas* had higher survival after three years than scionwood grafted to *Surprise* with *Sparrow* and *Emma K* being intermediate. Grafts made on seedlings from nuts of *Kwik Krop* and *Thomas* had higher survival than grafts on *Sparrow* seedlings. Growth of scionwood for all five cultivars was similar when grafted on seedling rootstocks of *Kwik Krop*. In contrast, scionwood of *Surprise* had acceptable growth on seedlings rootstock of *Kwik Krop* and nursery bedrun seedling and the slowest growth on seedling rootstock from seed of either *Sparrow* or *Thomas*. Authors conclude the source of the rootstock for grafting walnut can have a greater impact on early growth of grafts than what scionwood was grafted to the rootstock.

