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Butternut (*Juglans cinerea*) Annotated Bibliography

M.E. Ostry, M.J. Moore, and S.A.N. Worrall

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Butternut (*Juglans cinerea*) has a native range from eastern Canada west to Minnesota and south to Arkansas, Alabama, Georgia, and Mississippi and frequently has been planted outside of this range. Also known as white walnut, lemonnut, or oilnut, butternut is valued for its wood, flavorful nuts, wildlife mast, and contribution to forest diversity.

Early utilization of butternut included the medicinal use of bark, roots, and husks; production of syrup, dyes, and oil; as well as the use of its toxic bark to stun fish in small streams. However, butternut's widely scattered growth habit within forest stands, its relatively soft wood, small to medium kernel, and hard shell have prevented it from becoming a commercially important timber or nut species.

Butternut canker, first reported in 1967, is killing butternut throughout its range in North America and is threatening its survival as a viable species. As a result, State and Federal management guidelines have been enacted, and research and conservation practices to restore butternut are underway in Canada and the United States.

This bibliography is intended as a reference for researchers, land managers, and butternut enthusiasts. The literature on butternut has dramatically increased since butternut canker was first observed in the late 1960s (fig. 1). The search of major computerized literature databases and other sources of literature was completed in December 2002. Our objective was to include the major papers and reports on butternut that have been published and not to include all the popular articles and disease detection reports that have been published in various outlets. Literature citations are arranged alphabetically by author, and a subject index is included.

About The Authors:

M. E. Ostry is a Research Plant Pathologist, **M. J. Moore** is a Biological Technician, and **S.A.N. Worrall** is formerly a Biological Science Aid, USDA Forest Service, North Central Research Station, St. Paul, MN; Phone: (651) 649-5113.

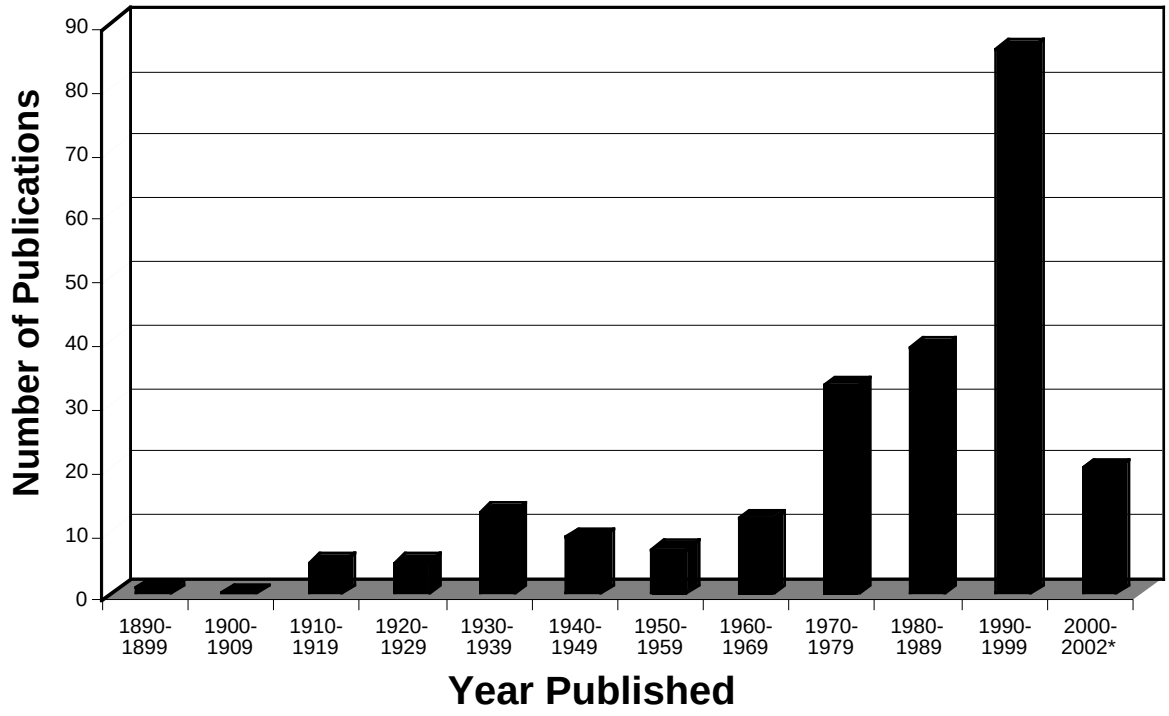

Figure 1.—Number of publications on *Juglans cinerea* from 1890 to 2002.

1. Anderson, Robert L. 1988. The butternut...outlook grim. American Forests. 94(9,10): 49.
Describes the impact of butternut canker.

2. Anderson, Robert L. 1996. Butternut canker. In: Proceedings, Southern Appalachian biological control initiative workshop; 1996 September 26-27; Asheville, NC. South East Regional Association of Medical and Biological Organizations (SERAMBO): 4 p. [Available online: http://www.main.nc.us/SERAMBO/BControl/butternut.html].
Describes the butternut canker disease, its impact, and the potential of finding and propagating resistant trees for restoration.

3. Anderson, Robert L.; LaMadeleine, Leon A. 1978. The distribution of butternut decline in the eastern United States. For. Insect and Dis. Manage. Surv. Rep. S-3-78. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area, State and Private Forestry. 5 p.
Results of a region-wide survey done in 1978. Affected trees were found in 14 of 16 States surveyed, and Sirococcus *was isolated from samples from 8 States.*

4. Ashworth, Fred L. 1965. Is the butternut our most promising undeveloped nut? Annual Report of the Northern Nut Growers Association. 56: 114-116.
Mentions a "dead limb disease" to which butternuts are susceptible. Also details the discovery of the "Chamberlin" butternut, and describes its good cracking quality and hardiness.

5. Ashworth, Fred L. 1969. Butternuts, siebold (Japanese) walnuts, and their hybrids. In: Jaynes, Richard A., ed. Handbook of North American nut trees. Knoxville, TN: The Northern Nut Growers Association: 224-231.
Describes butternuts, Japanese walnuts, and their hybrids. Includes the characteristics of named varieties, grafting methods used, and describes the Melanconis disease.

6. Balser, Dan. 1995. Butternut...a threatened species. The Ohio Woodland Journal. 2(2): 6-7.
Lists insect pests and diseases that affect butternut, focusing on butternut canker. Symptoms, present status, and management guidelines are reviewed.

7. Beardmore, Tannis. 1998. An *ex situ* conservation strategy for butternut. In: Carter, N.E., comp. Proceedings, Northeastern Forest Pest Council annual meeting; 1998 March 9-11; Fredericton, New Brunswick, Canada. Fredericton, New Brunswick, Canada: Department of Natural Resources and Energy: 40. [Abstract].
Ultra-low, -196° C cryopreservation of butternut embryonic axes was explored. Despite significant tree-to-tree variation, it may be a viable method of ex situ *conservation.*

8. Beardmore, Tannis; Vong, Wendy. 1998. Role of the cotyledonary tissue in improving low and ultralow temperature tolerance of butternut (*Juglans cinerea*) embryonic axes. Canadian Journal of Forest Research. 28: 903-910.
Butternuts typically lose viability when stored for long periods of time. This study explored possibilities of low temperature storage of excised embryos. Germination generally decreased with exposure to lower temperatures. Embryos with some cotyledonary tissue attached and slowly desiccated to 4.8% water or less had the best chance of surviving ultra-low (-196° C) temperatures.

9. Belisario, A.; Zoina, A.; Pezza, L.; Luongo, L. 1999. Susceptibility of species of *Juglans* to pathovars of *Xanthomonas campestris*. European Journal of Forest Pathology. 29: 75-80.
Bacterial blight is a serious disease affecting the genus Juglans. *Among the species tested,* J. regia *was the most susceptible, and* J. cinerea *was among the most resistant.*

10. Bergdahl, D.R.; Halik, S. 1997. The butternut canker fungus recovered from insects collected on *Juglans cinerea*. In: Laflamme, G.; Bérubé, J.A.; Hamelin, R.C., eds. Foliage, shoot and stem diseases of trees: Proceedings of the IUFRO WP 7.02.02 meeting; 1997 May 25-31; Québec City, Québec, Canada. Inf. Rep. LAU-X-122. Sainte-Foy, Québec, Canada: Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre: 133-137.

Insects were collected from butternut trees in Vermont and tested for the presence of Sirococcus clavigignenti-juglandacearum *spores. Three beetle species were found to carry spores on their bodies, mostly from freshly cut logs or branches.*

11. Bergdahl, D.R.; Landis, J.N.; Bergdahl, A.D.; Teillon, H.B. 1996. Status of butternut canker in northwestern Vermont. Supplement to Phytopathology. 86(11): S119. [Abstract].

During 1993-94, butternuts were evaluated for the incidence of butternut canker at 18 sites. Out of 1,317 trees, 94% were infected.

12. Beuchat, L.R. 1978. Relationship of water activity to moisture content in tree nuts. Journal of Food Science. 43: 754-755, 758.

Experiments were conducted to determine the effects of moisture and oil content on the water activity (a_w, a measure based on equilibration with a given humidity) of several nut meats, including butternuts. Butternut had a middle range of a_w.

13. Bish, Cyril. 1990. N.N.G.A. nut evaluation: 1989 nut crop. Annual Report of the Northern Nut Growers Association. 81: 47-55.

Evaluates the 1989 nut crop by the Nebraska scoring system. Includes an evaluation of a number of butternut selections.

14. Bixby, Willard G. 1919. The butternut and the Japan walnut. American Nut Journal. 10(6): 76-83.

Describes attempts to distinguish between heartnuts, butternuts, Japan walnuts, and their hybrids. Heartnuts often produce butternut-like progeny because of frequent hybridization with native butternuts.

15. Black, W.M.; Neely, Dan. 1978. Relative resistance of *Juglans* species and hybrids to walnut anthracnose. Plant Disease Reporter. 62(6): 497-499.

Various nut trees, mostly Juglans *species and hybrids, were inoculated with spores of* Gnomia leptostyla. *Butternut was more resistant than black walnut, but more susceptible than butternut/ Japanese hybrids.*

16. Bonner, Franklin T. [In press]. *Juglans* L., walnut. In: Bonner, Franklin T., tech. coord. Woody plant seed manual. Washington, DC: U.S. Department of Agriculture, Forest Service. [Avaiolable online: http://www.wpsm.net].

Describes seed collection treatment and germination of the most common Juglans *species. It includes common nursery practices and a number of tables including phenology, seed yield, stratification procedures, and germination rates.*

17. Brinkman, Kenneth A. 1974. *Juglans* L. (Walnut). In: Schopmeyer, C.S., tech. coord. Seeds of woody plants in the United States. Agric. Handb. 450. Washington, DC: U.S. Department of Agriculture, Forest Service: 454-459.

A manual on the collection, treatment, and planting of walnut and butternut seeds. Butternut requires 90-120 days of cold stratification before germinating.

18. Brooks, Fred E. 1922. Curculios that attack the young fruits and shoots of walnut and hickory. Bull. No. 1066. Washington, DC: U.S. Department of Agriculture. 16 p.

A description of the life cycle and damage caused by four different species of curculios. The butternut curculio feeds mainly on butternut and Japanese walnut. The walnut curculio may occasionally feed on butternut. The other two feed on hickory. Suggested control measures are mentioned.

19. Brooks, Reid M.; Olmo, H.P. 1984. Register of new fruit and nut varieties list 34. HortScience. 19(3): 359-363.

Lists "Stark Bountiful" butternut as a patented variety and includes a brief description.

20. Brown, Jean-Louis. 1975. Extension de l'aire de distribution de *Juglans cinerea* L. au Quebec: Extension of the area of distribution of *Juglans cinerea* L. in Québec. Le Naturaliste Canadien. 102: 371-372.

Article in French. Describes an area containing butternut trees, near La Tuque, Quebec, that is about 20 km farther north than the previously known northern limit of its range.

21. Burbank, Luther. 1915. On nut growing. In: Whitson, John; John, Robert; Smith Williams, Henry, eds. Luther Burbank - his methods and discoveries and their practical application. New York, NY: Luther Burbank Press: 11: 30-33.

Describes walnut production but mentions that many people would put butternuts at the head of the list for best taste.

22. Burgart, Harry P. 1942. Butternut propagation and other notes. Annual Report of the Northern Nut Growers Association. 33: 78-79.

Describes early grafting attempts with the "Craxezy" butternut.

23. Burgart, Harry P. 1944. Origin of the Craxezy butternut. Annual Report of the Northern Nut Growers Association. 35: 59-60.

Describes the discovery of the "Craxezy" butternut.

24. Busov, Victor B.; Rink, George; Schlarbaum, Scott E.; Zuo, Jinghua. 1996. Allozyme variation within and among several *Juglans* L. species and their hybrids. In: Van Sambeek, J.W., ed. Knowledge for the future of black walnut: Proceedings of the 5th black walnut symposium; 1996 July 28-31; Springfield, MO. Gen. Tech. Rep. NC-191. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 69. [Abstract].

Allozyme data for 10 loci were compared for discriminating between butternut, heartnut, and black walnut. Several enzyme systems were promising for discrimination between species and butternut/heartnut hybrids. Outcrossing rates and heterozygosity were also calculated.

25. Campbell, Faith Thompson. 1994. Killer pigs, vines, and fungi: alien species threaten native ecosystems. Endangered Species Technical Bulletin. 19(5): 3-5.

Describes the butternut canker fungus as one of many exotic plants, insects, pathogens, and animals that threaten American ecosystems.

26. Campbell, Faith Thompson. 1996. The invasion of the exotics. Endangered Species Bulletin. 21(2): 12-13.

Describes the butternut canker fungus as one of many exotics (including plants, insects, pathogens, and animals) that threaten American ecosystems.

27. Campbell, Faith Thompson; Schlarbaum, Scott E. 1994. Fading forests - North American trees and the threat of exotic pests. New York, NY: Natural Resources Defense Council, Inc. 47 p.

Reviews a number of exotic pest and disease problems, including butternut canker. Also mentions possible future threats and gives suggestions for a comprehensive prevention and management program.

28. Campbell, Faith Thompson; Schlarbaum, Scott E. 2002. Fading forests II - trading away America's natural heritage (available only on CD). Healing Stones Foundation in cooperation with American Lands Alliance and the University of Tennessee, Knoxville.

Discusses the problem of invasive exotic organisms, the common pathways of introduction, and issues related to the prevention of introduction. Reviews trade regulations, implementation, and needed changes. Butternut canker is described as an example of an exotic disease organism.

29. Campbell, Julian J.N. 1989. Historical evidence of forest composition in the Bluegrass Region of Kentucky. In: Rink, G.; Budelsky, C.A., eds. Proceedings of the 7th central hardwood forest conference; 1989 March 5-8; Carbondale, IL. Gen. Tech. Rep. NC-132. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 231-246.

A review from historical records of the forest composition of the Bluegrass Region of Kentucky. Many records did not distinguish between black walnut and butternut, but those that did distinguish between the two mentioned butternut (white walnut) as frequently as black walnut.

30. Chandler, R. Frank; Freeman, Lois; Hooper, Shirley N. 1979. Herbal remedies of the maritime Indians. Journal of Ethnopharmacology. 1: 49-68.

Describes some of the herbal remedies used in the past by the maritime Indians of eastern Canada. Mentions that butternut bark was used as a reliable purgative (laxative).

31. Clark, F. Bryan. 1958. Silvical characteristics of butternut. Misc. Rel. 28. Columbus, OH: U.S. Department of Agriculture, Forest Service, Central States Forest Experiment Station. 9 p.

Describes the site preferences, associated species, growth characteristics, and pest and disease problems of butternut.

32. Clark, F. Bryan. 1965. Butternut (*Juglans cinerea* L.). In: Fowells, H.A., comp. Silvics of forest trees of the United States. Washington, DC: U.S. Department of Agriculture, Forest Service: 208-210.

Describes the site preferences, associated species, growth characteristics, and pest and disease problems of butternut. A detailed map of its range is included.

33. Cogliastro, Alain; Gagnon, Daniel; Bouchard, André. 1993. Effet des sites et des traitements sylvicoles sur la croissance, l'allocation en biomasse et l'utilisation de l'azote de semis de quatre espèces feuillues en plantations dans le sud-ouest du Quebec: Effect of site and silvicultural treatment on growth, biomass allocation, and nitrogen utilization of seedlings of four broadleaf species in plantations in southwest Québec. Canadian Journal of Forest Research. 23: 199-209.

Article in French with an English abstract. Butternut was among four species planted to identify conditions leading to the successful establishment of plantations. Biomass allocation and nitrogen nutrition were analyzed. Weed control with glyphosate increased growth. Mortality was highest where water availability was lowest.

34. Cogliastro, Alain; Gagnon, Daniel; Bouchard, André. 1997. Experimental determination of soil characteristics optimal for the growth of ten hardwoods planted on abandoned farmland. Forest Ecology and Management. 96: 49-63.

The growth and survival of 10 different hardwoods including butternut were recorded over a range of soil and geological conditions. Butternut grew slowly but adapted to a wide range of soil types.

35. Corneil, Jeffrey A.; Wilson, Louis F. 1979. Life history of the butternut curculio, *Conotrachelus juglandis* (Coleoptera: Curculionidae), in Michigan. The Great Lakes Entomologist. 14(1): 13-15.

The life cycle of the butternut curculio was studied in Michigan. It has one generation per year. The major injury is caused by larval tunneling in the pith and girdling at the base of new shoots. Spring feeding by adults injures young shoots.

36. Crane, H.L.; Reed, C.A.; Wood, M.N. 1937. Nut breeding. In: Yearbook of agriculture. Washington, DC: U.S. Department of Agriculture: 827-899.

Describes histories of breeding most nut bearing trees in the U.S., including butternut. Includes information on how to perform controlled pollinations.

37. Crawford, Martin. 2000. The butternut and the buartnut. Yearbook - West Australian Nut and Tree Crops Association. 24: 54-62.

Describes the characteristics, uses, cultivation, insect pests, and diseases of butternut and its hybrids. Lists known cultivars of butternut and buartnut.

38. Cummings Carlson, Jane. 1993. Butternut: are there any healthy trees left? Wisconsin Christmas Tree Producers Association Quarterly Journal. 8(2): 28-31. Also printed in: Woodland Management. 14(2): 11-12.

Describes the impact of butternut canker in Wisconsin. The disease had spread throughout nearly the entire range of butternut with high percentages of trees infected.

39. Cummings Carlson, Jane. 1997. Silviculture of butternut: relationship between size of canopy opening, disease development and host survival. In: Forest health conditions in Wisconsin annual report 1997. Madison, WI: Wisconsin Department of Natural Resources, Forest Health Protection Unit: 59-63.

Butternut seedlings were planted in two different habitat types in five different canopy openings to test for optimal conditions to promote growth and reduce disease severity. Interim results showed greater diameter and height growth in the better habitat type.

40. Cummings Carlson, Jane; Guthmiller, Mark. 1993. Incidence and severity of butternut canker in Wisconsin in 1976 and 1992. Phytopathology. 83(12): 1352. [Abstract A188].

Reports on the percentages of trees surveyed that were infected in 1976 and 1992. In 1992, 92% of surveyed trees were infected and 27% were dead.

41. Cummings Carlson, Jane; Kopitzke, David. 1997. Wisconsin's increasingly rare butternuts. Woodland Management. 18(3): 9-14.

Describes butternut tree characteristics and butternut canker. Includes suggestions to landowners on how to identify diseased trees, encourage butternut regeneration, decide when to harvest, and report the presence of potentially resistant trees.

42. Davidson, J.; Reed, C.A. 1954. Other species of walnut. In: Improved nut trees of North America. New York, NY: Devin-Adair: 95-104.

Describes the history, utilization, and varieties of butternuts, other Juglans *species, and hybrids.*

43. Davidson, John. 1943. The status of nut growing in 1943. Annual Report of the Northern Nut Growers Association. 34: 22-46.

Results of a survey sent to nut growers in the U.S. and Canada covering many topics involved in nut growing. A number of topical sections mention butternut including soil, diseases, nut bearing, and named varieties.

44. Davie, Bill; Davie, Lois. 1977. Budding persians, black walnuts, heartnuts, and butternuts on black walnut rootstocks. Annual Report of the Northern Nut Growers Association. 68: 108-110.

Describes a technique using greenwood field grafting with several species of nut trees, including butternuts. Authors often achieved 90% success.

45. Davie, Bill; Davie, Lois. 1980. Greenwood tip grafting for nut tree propagation. Annual Report of the Northern Nut Growers Association. 71: 63-65.

Describes a technique using greenwood field grafting with several species of nut trees, including butternuts, and compares results with budding.

46. Davis, C.N.; Myren, D.T.; Czerwinski, E.J. 1992. First report of butternut canker in Ontario. Plant Disease. 76(9): 972.

Sirococcus clavigignenti-juglandacearum *was confirmed on butternut trees in southern Ontario.*

47. Davis, Corwin. 1966. The butternut. Annual Report of the Northern Nut Growers Association. 57: 101-102.

Describes butternut tree and nut characteristics. Author offers suggestions for hulling and cracking the nuts, and mentions observations on grafting.

48. Davis, Donald D. 1996. Where have all the butternut trees gone? Pennsylvania Forests. 87(1): 15-17.

Describes butternut characteristics, disease symptoms, and biology, and efforts to combat the problem through management and the discovery of resistant trees.

49. Delcourt, Hazel R. 1979. Late quaternary vegetation history of the eastern Highland Rim and adjacent Cumberland Plateau of Tennessee. Ecological Monographs. 49(3): 255-280.

Sediment cores were taken from two pond sites and analyzed for pollen and plant fossils. Butternut was among the first taxa to replace the boreal conifer forest after late-glacial climatic amelioration.

50. Doyon, Frédérik; Bouchard, André; Gagnon, Daniel. 1998. Tree productivity and successional status in Québec northern hardwoods. Ecoscience. 5(2): 222-231.

The study calculated age, production, and biomass of 12 northern hardwoods, including butternut, along a stand age gradient in southwest Québec. Data from butternut clearly grouped it with early successional species.

51. Federspiel, M.C.; Nair, V.M.G. 1982. Infection processes and host-parasite interactions in butternut canker caused by *Sirococcus clavigignenti-juglandacearum*. Bulletin of the Botanical Club of Wisconsin. 14(3): 33-34.

Young butternut seedlings were infected when wounded, sprayed with a spore suspension, and enclosed in 95-100% humidity. At 50-75% humidity infection did not result. Infected tissue was microscopically examined, revealing hyphae penetrating through leaf scars.

52. Fjellstrom, R.G.; Parfitt, D.E. 1994. Walnut (*Juglans* spp.) genetic diversity determined by restriction fragment length polymorphisms. Genome. 37: 690-700.

The genetic diversity of 13 Juglans *species was characterized using nuclear RFLPs (DNA restriction fragments). Results suggested that butternut be included with section* Cardiocaryon *(oriental walnuts). Named varieties and the general population of butternut showed low variability, although a North Carolina population of butternut showed substantial variation.*

53. Fjellstrom, R.G.; Parfitt, D.E. 1995. Phylogenetic analysis and evolution of the genus *Juglans* (*Juglandaceae*) as determined from nuclear genome RFLPs. Plant Systematics and Evolution. 197: 19-32.

Phylogenic relationships between Juglans *species were studied using RFLPs. Allele frequency data and fragment data were used to create distance matrices and perform parsimony analysis. Results suggested that butternut should be grouped with the oriental walnuts.*

54. Fleguel, V. Rosemary. 1996. A literature review of butternut and the butternut canker. Inf. Rep. 20. Kemptville, Ontario, Canada: Eastern Ontario Model Forest. 32 p.

Describes butternut characteristics, seed propagation, grafting, butternut canker, and management guidelines. Includes information gathered from personal communication with individuals researching butternut canker.

55. Fleming, R.A. 1970. Nut culture in Ontario. Publ. 494. Toronto, Ontario, Canada: Ontario Department of Agriculture and Food. 10 p.

Lists butternut among several nut tree species that will grow in southern Ontario. Includes information on planting, propagation, cultivation, and harvesting.

56. Forest Gene Conservation Association. [n.d.]. A landowner's guide to butternut canker in Ontario. Kemptville, Ontario, Canada: Forest Gene Conservation Association. n.p.

Describes the symptoms of butternut canker with management guidelines and suggestions for identifying potentially resistant trees. Includes a chart on distinguishing between butternut and walnut. Illustrated.

57. Fuller, Andrew S. 1912. The walnut. In: The nut culturist. New York, NY: Orange Judd Company: 203-253.

Describes the characteristics, history, and culture of several species of walnut including butternut.

58. Funk, David Truman. 1972. Identification and performance of *Juglans* hybrids. Dissertation Abstracts International B - Agriculture, Forestry and Wildlife. 32(12): 6761-6762. [Abstract].

A number of quantitative leaf and twig characteristics were used to differentiate between J. nigra, J. regia, *and their hybrids, and between* J. sieboldiana, J. cinerea, *and their hybrids. Chromatography of polyphenol extracts from leaves was also used. Hybrid indices were developed using both techniques.*

59. Funkhouser, W.D. 1915. Note on the life history of *Enchenopa binotata* Say (Membracidae) on the butternut. Journal of Economic Entomology. 8: 368-371.

A description of the life cycle of Enchenopa binotata. *It often lives on other trees and shrubs, but it is abundant on butternut and has distinct habits on this tree.*

60. Furnier, Glenn R.; Stolz, Allison, M.; Mustaphi, Raka M.; Ostry, Michael E. 1999. Genetic evidence that butternut canker was recently introduced into North America. Canadian Journal of Botany. 77: 783-785.

Samples of Sirococcus clavigignenti-juglandacearum *were collected throughout the native range of butternut. Using RAPD markers, the fungus was found to be monomorphic, which suggests it came from a single recent introduction.*

61. Gellatly, J.U. 1966. Heartnuts - outstanding selections and some of their best hybrids. Annual Report of the Northern Nut Growers Association. 57: 103-110.

A description of nut qualities of heartnut and buartnut varieties.

62. Germain, E.; Hanquier, I.; Monet, R. 1993. Identification of eight *Juglans* spp. and their interspecific hybrids by isoenzymatic electrophoresis. Acta Horticulturae. 311: 73-85.

Isoenzyme polymorphism was analyzed in leaf tissue from eight Juglans *spp. and six hybrids. Nine enzymatic systems were used, showing a narrow intraspecific variability. This may be a useful diagnostic tool for identifying species and hybrids. In most enzyme systems, butternut either had distinct banding or had bands similar to that of the oriental walnuts.*

63. Gervais, C. 1963. Un nouval hybride naturel chez *Juglans*: A new natural hybrid in *Juglans*. Annales ACFAS. 29: 45. [Abstract].

Article in French. A natural hybrid of butternut and black walnut was discovered in the botanical garden of Marburg, Germany.

64. Gilmore, Melvin R. 1933. Some Chippewa uses of plants. Ann Arbor, MI: University of Michigan Press. 119-143.

Lists plants and trees used by the Chippewa. Butternut bark was used to make a brown dye, and sap was boiled and used as a cathartic.

65. Goldner, Richard D. 1978. Successful bud-grafting. Annual Report of the Northern Nut Growers Association. 69: 12-17.

Details the process of bud grafting, used for many nuts including butternuts. Describes many aspects of the process including scion storage, weather, cutting techniques, wrapping, and after care.

66. Goldner, Richard D. 1979. Fifteen years with grafted black walnuts and butternuts. Annual Report of the Northern Nut Growers Association. 70: 34-41.

Author describes his successes and failures with growing nut trees. Details include weather, soil conditions, and success of various named varieties.

67. Goodell, Edward. 1984. Walnuts for the northeast. Arnoldia. 44(1): 3-19.

Describes all the major Juglans *species including butternut, and provides suggestions for their culture.*

68. Gottschalk, Kurt W.; Ostry, Michael E.; Morin, Randall S.; Liebhold, Andrew M. 2002. Butternut (*Juglans cinerea* L.) distribution for estimating butternut canker mortality impacts and potential reintroduction of resistant trees. In: 87th Annual meeting of the Ecological Society of America and the 14th Annual international conference of the Society for Ecological Restoration; 2002 August 4-9; Tucson, AZ. [Abstract]. [Available online: http://199.245.200.45/pweb/?SOCIETY=esa&YEAR=2002].

FIA plot data were used to create a probability map of butternut occurrence across the eastern U.S. This analysis was used to identify candidate areas for possible resistant butternut reintroduction.

69. Graham, S.H. 1943. Better butternuts, please. Annual Report of the Northern Nut Growers Association. 34: 85-88.

A description of the good and poor qualities of butternuts. Among the poor qualities are early blooming, difficulty in grafting, butternut curculios, and the Melanconis disease.

70. Graves, Arthur Harmount. 1923. The Melanconis disease of the butternut (*Juglans cinerea L.*). Phytopathology. 13: 411-435.

A description of the Melanconis fungus on butternut. It includes details of the life cycle of the fungus and results of inoculation studies.

71. Graves, H.S. 1913. Butternut *Juglans cinerea* Linnaeus. In: Forest atlas of the national forests of the United States. Washington, DC: U.S. Department of Agriculture, Forest Service: n.p.

A map showing the known range of butternut as of 1913.

72. Grimm, Eric C. 1984. Fire and other factors controlling the Big Woods vegetation of Minnesota in the mid-nineteenth century. Ecological Monographs. 54(3): 291-311.

Bearing-tree data from the original land survey records of 1847-1850 were used to reconstruct the vegetation of the Big Woods and prairie-woodland border in south-central Minnesota. Butternut consisted of 0.9% of the bearing trees. Vegetation type was related to physical firebreaks and to the presence or absence of fire.

73. Halik, S.; Bergdahl, D.R. 1996. *Sirococcus clavigignenti-juglandacearum* isolated from beetles collected from *Juglans cinerea*. Supplement to Phytopathology. 86(11): S122. [Abstract].

Sirococcus clavigignenti-juglandacearum *was isolated from the bodies of several beetle species collected from butternut logs and stems.*

74. Halik, S.; Bergdahl, D.R. 2002. Potential beetle vectors of *Sirococcus clavigignenti-juglandacearum* on butternut. Plant Disease. 86: 521-527.

Beetles of 17 species, collected from diseased trees, logs, and branches of butternut, were found to carry conidia of Sirococcus clavigignenti-juglandacearum. *These beetles were most often found on dead stems and branches where the fungus was fruiting.*

75. Hamel, Paul B.; Chiltoskey, Mary U. 1975. Cherokee plants and their uses—a 400 year history. Sylva, NC: Herald Publishing Co. 65 p.

Lists plants and trees that were used by the Cherokee Indians. Butternut bark was used as a cathartic, for toothache, and for dye.

76. Harlow, William M.; Harrar, Ellwood S. 1996. *Juglans cinerea* L. - butternut. In: Textbook of dendrology - covering the important forest trees of the United States and Canada. 5th ed. New York, NY: McGraw-Hill Book Co.: 243-245.

A general description of butternut tree characteristics.

77. Harrison, K.J.; Hurley, J.E.; Ostry, M.E. 1998. First report of butternut canker caused by *Sirococcus clavigignenti-juglandacearum* in New Brunswick, Canada. Plant Disease. 82(11): 1282.

The butternut canker fungus was isolated from branches in several locations in New Brunswick, Canada. A sample was included from the far northeastern corner of the tree's range.

78. Harrison, Ken J.; Hurley, J. Edward. 1998. Butternut canker - a first record for New Brunswick. Tech. Note 315. Fredericton, New Brunswick, Canada: Canadian Forest Service, Atlantic Forestry Centre. 3 p.

A search for butternut canker near the Maine-New Brunswick border confirmed the presence of the fungus in several locations.

79. Haynes, S. Clark. 1994. Butternut canker in West Virginia. Annual Report of the Northern Nut Growers Association. 85: 61-62.

A status report describing the search for canker-resistant butternuts in West Virginia. Only one tree fit the criteria for selecting potentially resistant trees.

80. Heimann, M.F; Stevenson, W.R. 1997. Walnut and butternut toxicity. Urban Phytonarian Ser. A3182. Madison, WI: University of Wisconsin-Extension. 2 p.

A description of walnut and butternut root toxicity, caused by juglone, affecting a number of plants. Lists sensitive and tolerant species and offers suggestions for homeowners to minimize the problem.

81. Hepting, George H. 1971. Butternut - *Juglans cinerea*. In: Diseases of forest and shade trees of the United States. Agric. Handb. 386. Washington, DC: U.S. Department of Agriculture, Forest Service: 187-195.

Describes the Melanconis disease and some other common diseases of butternut.

82. Herrick, James William. 1977. Iroquois medical botany. Albany, NY: State University of New York. 557 p. Ph.D. Dissertation.

Describes Iroquois medical uses of plants. Butternut was used to stop bleeding, for yellow skin, mouth ulcers, toothache, and venereal disease, as a laxative, and a dye.

83. Hopkin, A.; Innes, L.; Harrison, K. 2000. Distribution of butternut canker (*Sirococcus clavigignenti-juglandacearum*) in eastern Canada. Canadian Plant Disease Survey. 81: 154-157.

Results of surveys in eastern Canada were mapped, showing the distribution of butternut canker in the region.

84. Hopkin, A.; Innes, L.; Harrison, K. 2001. Distribution of butternut canker (*Sirococcus clavigignenti-juglandacearum*) in eastern Canada. Frontline Express Bull. No. 2. Sault Ste. Marie, Ontario, Canada: Canadian Forest Service, Great Lakes Forestry Centre. 2 p. [Available online: http://www.glfc.forestry.ca/frontline/bulletins/bulletin_no.2_e.html].

Describes the symptoms and distribution of butternut canker in eastern Canada.

85. Hutchins, Lee M.; Wester, Horace V. 1947. Graft-transmissible brooming disease of walnut. Phytopathology. 37: 11. [Abstract].

A brooming disease of black walnut, butternut, and Japanese walnut was studied. Patch bark grafts transmitted the pathogen, thought to be a virus, in black and Japanese walnut.

86. Hyche, L.L. 1989. Seasonal cycle and habits of the butternut woolyworm. Bull. 601. Auburn, AL: Alabama Agricultural Experiment Station. 10 p.

The sawfly Eriocampa juglandis *is commonly called the butternut woolyworm. It was discovered in Alabama, further south than its previously reported range. The life cycle is described. It feeds on butternut, black walnut, and hickory.*

87. Innes, L. 1997. *Sirococcus clavigignenti-juglandacearum* on butternut and black walnut fruit. In: Laflamme, G.; Bérubé, J.A.; Hamelin, R.C., eds. Foliage, shoot and stem diseases of trees: Proceedings of the IUFRO WP 7.02.02 meeting; 1997 May 25-31; Québec City, Québec, Canada. Inf. Rep. LAU-X-122. Sainte-Foy, Québec, Canada: Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre: 129-132.

Sirococcus clavigignenti-juglandacearum *was isolated from both butternut and black walnut fruits. Other pathogenic fungi were also isolated.*

88. Innes, Louise; Rainville, André. 1996. Distribution et détection du *Sirococcus clavigignenti-juglandacearum* au Québec: Distribution and detection of *Sirococcus clavigignenti-juglandacearum* in Quebec. Phytoprotection. 77(2): 75-78.

Article in French with English abstract. Butternut canker was first reported in Quebec in 1990. In 1995 it was isolated from both butternut and walnut seedlings in two nurseries for the first time.

89. Innes, Louise; Rainville, André. 1998. Distribution and detection of the *Sirococcus* canker of butternut in Quebec. In: Carter, N.E., comp. Proceedings, Northeastern Forest Pest Council annual meeting; 1998 March 9-11; Fredericton, New Brunswick, Canada. Fredericton, New Brunswick, Canada: Department of Natural Resources and Energy: 37-39.

The butternut canker fungus was found on butternut and walnut in nurseries and plantations, but caused less damage on walnut. A study of four new butternut plantations found canker present despite careful inspection and culling of seedlings. The disease was thought to be seedborne.

90. Jaynes, Richard A. 1969. Breeding improved nut trees. In: Jaynes, Richard A., ed. Handbook of North American nut trees. Knoxville, TN: The Northern Nut Growers Association: 376-399.

Reviews principles and techniques for nut breeding, and describes the hybridizing potential of Juglans *species, including butternut.*

91. Johnson, Robert W.; Tyree, Melvin T. 1992. Effect of stem water content on sap flow from dormant maple and butternut stems. Plant Physiology. 100: 853-858.

Sap flow from excised maple and butternut stems was correlated with stem water content. Exudation varied depending on water content, timing, and freeze/thaw cycles.

92. Kaeiser, M.; Funk, D.T. 1971. Structural changes in walnut grafts. Annual Report of the Northern Nut Growers Association. 62: 90-94.

Several Juglans *species and hybrids, including butternut, were grafted in 22 scion-stock combinations. At different times grafts were removed for microscopic examination. All were at least partly compatible in the earliest stages.*

93. Kaeiser, Margaret; Jones, Jay H.; Funk, David T. 1975. Interspecific walnut grafting in the greenhouse. The Plant Propagator. 20(4): 2-7 and 21(1): 2-7.

Cleft and bark grafts were performed in the greenhouse using a number of Juglans *species and hybrids (including butternut) for scions and black walnut, Persian walnut, and Japanese walnut as rootstock. Success after 2 years was 80% for butternut on black walnut. Overall success was 74%.*

94. Katovich, Steven A.; Ostry, Michael E. 1998. Insects associated with butternut and butternut canker in Minnesota and Wisconsin. The Great Lakes Entomologist. 31(2): 97-108.

Sirococcus clavigignenti-junglandacearum *was isolated from several species of insects collected from diseased butternut trees. Potential disease vectors included beetles from three different coleopteran genera.*

95. Keifer, Hartford H.; Baker, Edward W.; Kono, Tokuwo; Delfinado, Mercedes; Styer, William E. 1982. An illustrated guide to plant abnormalities caused by eriophyid mites in North America. Agric. Handb. 573. Washington, DC: U.S. Department of Agriculture, Agricultural Research Service. 178 p.

Describes the eriophyid mites of many species, including Eriophyes cinereae, *which creates puckered galls on butternut leaves.*

96. Krochmal, Arnold; Krochmal, Connie. 1982. Genus *Juglans* L. - walnut. In: Uncultivated nuts of the United States. Agric. Inf. Bull. 450. Washington, DC: United States Department of Agriculture, Forest Service: 51-58.

Describes native nut species in the U.S., including butternut. Lists several past uses for butternuts, including medicinal, dyes, and food products.

97. Kuntz, J.E.; Nair, V.M.G. 1982. The role of hyphal pegs in spore dissemination by *Sirococcus clavigignenti-juglandacearum*. Phytopathology. 72(8): 1137. [Abstract].

Hyphal pegs loosen and crack the outer bark of butternut, and expose pycnidia from which the spores extrude.

98. Kuntz, James E.; Nair, V.M. Ganga. 1982. Hyphal pegs and pycnidia produced by *Sirococcus clavigignenti-juglandacearum*. Bulletin of the Botanical Club of Wisconsin. 14(3): 35. [Abstract].

The fungus that causes butternut canker produces hyphal pegs and pycnidia from which conidia are extruded.

99. Kuntz, J.; Prey, A.; Ambuel, B.; Sarkis, E. 1978. The etiology and epidemiology of butternut canker. In: Proceedings of the 69th Annual meeting of the American Phytopathological Society; 1977 August; East Lansing, MI. St. Paul, MN: American Phytopathological Society. 4: 84. [Abstract].

Describes the symptoms and effects of butternut canker, fruiting bodies, and spore dissemination of the fungus. Inoculation of seedlings with the fungus resulted in lesions and seedling death.

100. Kuntz, J.E.; Prey, A.J.; Jutte, S.; Nair, V.M.G. 1979. The etiology, distribution, epidemiology, histology and impact of butternut canker in Wisconsin. In: Walnut insects and diseases, workshop proceedings; 1978 June 13-14; Carbondale, IL. Gen. Tech. Rep. NC-52. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 69-72.

Describes the fungal biology and impact of butternut canker.

101. Lambert, France; Truax, Benoit; Gagnon, Daniel; Chevrier, Normand. 1994. Growth and N nutrition, monitored by enzyme assays, in a hardwood plantation: effects of mulching materials and glyphosate application. Forest Ecology and Management. 70: 231-244.

The effects of mulching materials and glyphosate application on growth and nitrogen nutrition of seedlings of butternut, white ash, and bur oak were studied. Butternut was most responsive to herbicide application. Mulching alone was only somewhat effective with butternut. Butternut had the highest level of nitrate reductase activity.

102. Landis, J.N.; Bergdahl, D.R. 1996. Incidence of butternut canker spatially related to tree density. Supplement to Phytopathology. 86(11): S123. [Abstract].

Butternut trees in northwestern Vermont were surveyed and entered into a GIS database. Analysis of spatial relationships revealed that rain splash spore dissemination explains only some of the distribution of butternut canker.

103. LandOwner Resource Centre. 1996. Butternut. Ext. Notes Agdex 330. Ontario, Canada: Ontario Ministry of Natural Resources, Eastern Ontario Model Forest. 6 p.

Describes the characteristics of butternut, with guidelines for planting and growing the tree. Illustrated.

104. Larsen, Esther Louise. 1942. Pehr Kalm's observations on black walnut and butternut trees. Agricultural History. 16: 149-157.

A translation of an article written in 1769 by a Swedish botanist. It describes habits and uses of black walnuts and butternuts in the 1700s.

105. Lauriault, Jean. 1989. Identification guide to the trees of Canada. Markham, Ontario, Canada: Fitzhenry & Whiteside. 479 p.

Describes characteristics and uses of the butternut tree.

106. Lefevre, Henry E. 1964. Experimenting with nut trees in Huntingdon County, Quebec. Annual Report of the Northern Nut Growers Association. 55: 106-109.

Mentions the abundance of butternuts in that area.

107. Leffel, Robert C. 1996. Butternut trees: what else can be done? Pennsylvania Forests. 87(3): 19.

Discusses the possibility of using backcross breeding as a means of producing resistant butternuts.

108. Loo, Judy. 1998. Development of conservation strategies for New Brunswick trees at risk. In: Carter, N.E., comp. Proceedings, Northeastern Forest Pest Council annual meeting; 1998 March 9-11; Fredericton, New Brunswick, Canada. Fredericton, New Brunswick, Canada: Department of Natural Resources and Energy: 30-36.

Uses butternut as an example in a discussion of what is needed for an effective conservation strategy. Discusses in situ *and* ex situ *efforts, planning, and implementation.*

109. Lounsberry, C.C. 1946. Nut trees for Iowa. Transactions of the Iowa State Horticultural Society. 81: 253-267.

Offers propagation and culture information on nut trees that grow in Iowa, including the butternut.

110. MacDaniels, L.H. 1950. How about the butternut? Annual Report of the Northern Nut Growers Association. 41: 125-129.

Describes some good and poor characteristics of butternut. Discusses nut characteristics of several named varieties, grafting preferences, diseases, and insect pests.

111. Majcen, Zoran. 1995. Le noyer cendré au lac Tapani: The butternuts of Lake Tapani. Note de Recherche Forestière n˚ 64. Sainte-Foy, Québec, Canada: Direction de la Recherche Forestière. 5 p.

Article in French with an English abstract. A few stands of butternut were found around Tapani Lake, about 40 km north of Mont-Laurier in Quebec. This is a northward extension of its known range.

112. Manning, Wayne E. 1978. The classification within the Juglandaceae. Annals of the Missouri Botanical Garden. 65: 1058-1087.

Describes the taxonomical classifications within the Juglandaceae family, with an emphasis on floral characteristics. Places butternut in its own subgroup, Trachycaryon.

113. Massey, A.B. 1925. Antagonism of the walnuts (*Juglans nigra* L. and *J. cinerea* L.) in certain plant associations. Phytopathology. 15: 773-784.

Describes several studies in which plants were killed by their association with walnut or butternut roots. Hypothesizes that a toxic substance is secreted by the roots, most likely juglone.

114. Matheron, M.E.; Mircetich, S.M. 1985. Relative resistance of different rootstocks of English walnut to six *Phytophthora* spp. that cause root and crown rot in orchard trees. Plant Disease. 69: 1039-1041.

Seedlings of various Juglans *species were tested for resistance to* Phytophthora citricola *in artificially inoculated biweekly flooded soil. Butternut was susceptible, as were all but Chinese wingnut (*Pterocarya stenoptera*).*

115. McDaniel, J.C. 1956. The pollination of Juglandaceae varieties - Illinois observations and review of earlier studies. Annual Report of the Northern Nut Growers Association. 47: 118-132.

Reviews the pollination habits of several Juglans *species. Most nut trees are dichogamous, resulting in a need for cross-pollination with several different varieties. Butternut and heartnut trees often hybridize. Includes a chart with pollination habits and dates for several varieties.*

116. McDaniel, J.C. 1981. Other walnuts including butternut, heartnut, and hybrids. In: Jaynes, R.A., ed. Nut tree culture in North America. Hamden, CT: Northern Nut Growers Association: 98-110.

Describes butternuts, heartnuts, and their varieties and hybrids. Mentions breeding, propagation, diseases, and insect pests.

117. McGranaham, Gale H.; Catlin, Peter B. 1987. Juglans rootstocks. In: Rom, Roy C.; Carlson, Robert F., eds. Rootstocks for fruit crops. New York, NY: John Wiley and Sons, Inc.: 411-450.

Describes characteristics of rootstocks used to graft Juglans regia. *Butternut is mentioned as hybridizing with* J. regia *and* J. ailantifolia.

118. McGranaham, Gale; Leslie, Charles. 1991. Walnuts (*Juglans*). Acta Horticulturae. 290: 907-951.

Describes nearly all Juglans *species, including diseases, insect pests, geographic range, silviculture, phenology, and nut production.*

119. McIlwrick, Ken; Wetzel, S.; Beardmore, T.; Forbes, K. 2000. *Ex situ* conservation of American chestnut (*Castanea dentata* (Marsh.) Borkh.) and butternut (*Juglans cinerea* L.), a review. The Forestry Chronicle. 76(5): 765-774.

Describes current and possible future strategies for conserving chestnut and butternut. Discusses issues such as genetic diversity, seed and pollen storage, tissue culture, breeding, asexual propagation, and disease control.

120. Miller, Regis B. 1976. Wood anatomy and identification of species of *Juglans*. Botanical Gazette. 137(4): 368-377.

Wood anatomy of 15 Juglans *species was investigated. Taxonomic keys based on wood structure were used to recognize four main groups. Butternuts were grouped with the oriental walnuts.*

121. Millikan, D.F. 1966. The butternut. American Nurseryman. 128(8): 15.

Describes the use of butternut as a yard and landscape tree. Nut characteristics, diseases, insect pests, and named varieties are discussed.

122. Millikan, D.F.; Hibbard, A.D. 1967. Butternuts, an overlooked tree crop. Annual Report of the Northern Nut Growers Association. 58: 120-122.

Discusses the lack of attention given to butternut as a wood or nut producing tree. Mentions how several negative characteristics may be overcome by planting superior varieties.

123. Millikan, D.F.; Stefan, Susan. 1983. Buttering up the butternut. Annual Report of the Northern Nut Growers Association. 74: 48-53.

Discusses the lack of attention given to the butternut. Describes 10 cultivars that were growing on the author's acreage and the most successful side grafting technique.

124. Millikan, D.F.; Stefan, Susan J. 1989. Current status of the butternut, *Juglans cinerea* L. Annual Report of the Northern Nut Growers Association. 80: 52-54.

Describes the threat of butternut canker, the search for improved cultivars, and the opportunity to preserve butternut in a repository.

125. Millikan, D.F.; Stefan, Susan J.; Rigert, Kathleen S. 1990. Selection and preservation of butternut, *Juglans cinerea* L. Annual Report of the Northern Nut Growers Association. 81: 22-25.

Describes the selection of superior cultivars of butternut. Thirteen cultivars have been sent to the National Clonal Germplasm Repository in Corvallis, Oregon, to be grafted for preservation and study.

126. Millikan, D.F.; Stefan, Susan J.; Shaffer, W.H., Jr. 1985. Butternuts worth propagating. Annual Report of the Northern Nut Growers Association. 76: 103-105.

Several named varieties were studied and rated for transplanting survival of grafts and for nut quality.

127. Millikan, D.F.; Stefan, S.J.; Shaffer, W.H., Jr. 1986. Recent observations on butternuts in Missouri. Annual Report of the Northern Nut Growers Association. 77: 108-110.

Seedlings from several named varieties were planted and evaluated. Superior parentage produced vigorous seedlings. A foliar disorder related to a mite infestation is described.

128. Moerman, Daniel E. 1998. Native American ethnobotany. Portland, OR: Timber Press. 927 p.

Lists many plants and their use by Native American tribes. Butternut was used by a number of eastern and northern tribes for medicine, food, building material, and dye. Medicinal uses include use as a cathartic (laxative), pain reliever, wound healer, and as a hair and skin aid.

129. Morin, Ricardo; Beaulieu, Jean; Daoust, Gaetan. 2000. Butternut, a threatened species showing a low genetic diversity. Network News - Forest Health and Biodiversity, Canadian Forestry Service. 4(1): 3-4.

Reviews the impact of butternut canker in Canada. Describes a study revealing the lack of genetic diversity in the butternut species and its implications. Several preservation efforts are mentioned.

130. Morin, Ricardo; Beaulieu, Jean; Deslauriers, Marie; Daoust, Gaëtan; Bousquet, Jean. 2000. Low genetic diversity at allozyme loci in *Juglans cinerea*. Canadian Journal of Botany. 78: 1238-1243.

Butternut leaf samples from relatively healthy stands in eastern Canada were analyzed for isozyme variation. Genetic diversity estimates were much lower than in other Juglans *species or other boreal tree species. Possible reasons and implications are discussed.*

131. Nair, V.M.G. 1999. Butternut canker - an international concern. In: Raychaudhuri, S.P.; Maramorosch, Karl, eds. Biotechnology and plant protection in forestry science. New Delhi, India: Oxford & IBH Publishing Co. Pvt. Ltd.: 239-252.

Describes the impact of butternut canker, fungal biology, host parasite interaction, and possible mechanisms of resistance. Also mentions the international concern due to the susceptibility of other Juglans *species. Illustrated.*

132. Nair, V.M.G.; Kostichka, C.J.; Kuntz, J.E. 1979. *Sirococcus clavigignenti-juglandacearum*: an undescribed species causing canker on butternut. Mycologia. 71: 641-646.

Describes the characteristics of the newly described fungus Sirococcus clavigignenti-juglandacearum.

133. Nekiassena, Vera. 1934. Letter on culture of butternuts and black walnuts. Annual Report of the Northern Nut Growers Association. 25: 114-115.

Describes nut trees growing in the U.S.S.R., and mentions that butternut is hardy in White Russia.

134. Nicholls, Thomas H. 1979. Butternut canker. In: Walnut insects and diseases: workshop proceedings; 1978 June 13-14; Carbondale, IL. Gen. Tech. Rep. NC-52. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 73-82.

The biology of butternut canker was studied by the dissection of diseased trees, spore trapping, artificial inoculation, and fungicide trials.

135. Nicholls, Thomas H.; Kessler, Kenneth J., Jr.; Kuntz, James E. 1978. How to identify butternut canker. HT-36. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. n.p.

Describes the symptoms of butternut canker. Includes descriptions of fruiting bodies, spores, and culturing techniques. Illustrated.

136. Omar, S.; Lemonier, B.; Jones, N.; Ficker, C.; Smith, M.L.; Neema, C.; Towers, G.H.N.; Goel, K.; Arnason, J.T. 2000. Antimicrobial activity of extracts of eastern North American hardwood trees and relation to traditional medicine. Journal of Ethnopharmacology. 73: 161-170.

Several eastern hardwood trees, including butternut, were among those plants used as medicine by Native Americans. Wood and bark extracts of 14 of these trees were tested for antimicrobial activity against eight bacteria and six fungi. Butternut bark extract had a broad spectrum of activity against three strains of bacteria and all six fungal strains.

137. Orchard, L.P. 1984. Butternut canker: host range, disease resistance, seedling-disease reactions, and seed-borne transmission. Madison, WI: University of Wisconsin. 145 p. Ph.D. dissertation.

Branches of several Juglans *species and their hybrids were wound inoculated, symptom development was monitored, and trees were ranked according to their susceptibility to butternut canker. Heartnut was least susceptible. A system of screening seedlings was developed. The pathogen was also isolated from butternut seeds.*

138. Orchard, L.P.; Kuntz, J.E. 1981. Disease reactions of walnut species to butternut canker. For. Res. Notes 246. Madison, WI: University of Wisconsin-Madison, Department of Forestry. 7 p.

Trees of several Juglans *species and hybrids were wound inoculated with the butternut canker fungus in the fall. By the following summer most had developed active cankers. Persian walnut was most susceptible and heartnut least susceptible among the species tested.*

139. Orchard, L.P.; Guries, R.P.; Kuntz, J.E. 1981. Butternut canker: screening seedlings for disease resistance. Phytopathology. 71(2): 247. [Abstract].

Butternut seedlings were inoculated with spore suspensions and were tested under various humidities, temperatures, and exposure times. After 13 weeks, 38% developed lesions and there was no significant difference among variables.

140. Orchard, L.P.; Kuntz, J.E.; Kessler, K.J., Jr. 1982. Reaction of *Juglans* species to butternut canker and implications for disease resistance. In: Black walnut for the future. Gen. Tech. Rep. NC-74. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 27-31.

Trees of several Juglans *species and hybrids were wound inoculated with the butternut canker fungus in the fall. By the following summer most had developed active cankers. Persian walnut was most susceptible and heartnut least susceptible among the species tested.*

141. Ostry, M.E. 1996. Conservation of butternut in the Eastern forests. In: McVey, G.; Nielsen, C., eds. Forest gene conservation - principles to practice: workshop proceedings; 1995 March 20-22; Ottawa, Ontario, Canada. WP-008. Kemptville, Ontario, Canada: Ontario Ministry of Natural Resources, Southern Region Science & Technology Transfer Unit: 47-49.

Describes butternut canker impact and efforts to conserve butternut through collection and propagation of healthy trees, harvest restrictions, and regeneration studies.

142. Ostry, M.E. 1997. Butternut canker in North America 1967-1997. In: Laflamme, G.; Bérubé, J.A.; Hamelin, R.C., eds. Foliage, shoot and stem diseases of trees: Proceedings of the IUFRO WP 7.02.02 meeting; 1997 May 25-31; Québec City, Québec, Canada. Inf. Rep. LAU-X-122. Sainte-Foy, Québec, Canada: Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre: 121-128.

Describes the history, impact, biology, and host range of butternut canker. Discusses efforts to preserve the tree through management, gene conservation, and preservation of resistant trees.

143. Ostry, M.E. 1997. *Sirococcus clavigignenti-juglandacearum* on heartnut (*Juglans ailantifolia* var. *cordiformis*). Plant Disease. 81(12): 1461.

Branch dieback was observed on heartnut. Hyphal pegs and conidia of Sirococcus clavigignenti-juglandacearum *were present and the fungus was isolated from samples. Inoculations of greenhouse butternut seedlings produced cankers similar to those caused by* Sirococcus *inoculations. This was the first report of the fungus on heartnut.*

144. Ostry, M.E. 1998. Butternut canker: a current example of the vulnerability of forest trees. In: Carter, N.E., comp. Proceedings, Northeastern Forest Pest Council annual meeting; 1998 March 9-11; Fredericton, New Brunswick, Canada. Fredericton, New Brunswick, Canada: Department of Natural Resources and Energy: 41-48.

Describes the impact, biology, and host range of butternut canker. Discusses management and preservation of potential resistant trees in clonal archives, and discusses current knowledge gaps.

145. Ostry, Michael E. 1996. Butternut canker: history, biology, impact, and resistance. In: Van Sambeek, J.W., ed. Knowledge for the future of black walnut: Proceedings of the 5th black walnut symposium; 1996 July 28-31; Springfield, MO. Gen. Tech. Rep. NC-191. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 192-199.

Describes the history, fungal biology, host range, and impact of butternut canker. Strategies are described to identify and preserve possible resistant butternut trees.

146. Ostry, Michael E. 2001. The need for butternut conservation. Annual Report of the Northern Nut Growers Association. 92(2001): 11-15.

Describes the impact of butternut canker and attempts to preserve butternut using clonal archives of putative resistant trees.

147. Ostry, M.E.; Pijut, P.M. 2000. Butternut: an underused resource in North America. HortTechnology. 10(2): 302-306.

Describes butternut uses, characteristics, and propagation. Reviews the butternut canker problem and recent research and conservation efforts.

148. Ostry, M.E.; Skilling, D.D. 1994. Butternut canker - past, present, future. In: Managing forests to meet people's needs: Proceedings of the 1994 Society of American Foresters/Canadian Institute of Forestry convention; 1994 September 18-22; Anchorage, AK. Bethesda, MD: Society of American Foresters: 469-470.

Describes the impact of butternut canker and current efforts at preservation.

149. Ostry, M.E.; Skilling, D.D. 1995. Butternut canker. In: Hutchinson, Jay G., ed. Northern hardwood notes. Note 7.11. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 5 p.

Describes the biology and impact of butternut canker, with management guidelines. Illustrated.

150. Ostry, M.E.; Katovich, S.; Anderson, R.L. 1997. First report of *Sirococcus clavigignenti-juglandacearum* on black walnut. Plant Disease. 81(7): 830.

Cankers and branch dieback were observed on walnut trees in North Carolina and Minnesota. Isolation from trees produced cultures identical to Sirococcus clavigignenti-juglandacearum *in both cases. Severe winter weather may have predisposed the Minnesota trees to infection from nearby infected butternut.*

151. Ostry, M.E.; Mielke, M.E.; Anderson, R.L. 1996. How to identify butternut canker and manage butternut trees. HT-70. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 8 p.

Describes symptoms of butternut canker. Includes recommendations for growing and managing butternut in the presence of the disease. Illustrated.

152. Ostry, M.E.; Mielke, M.E.; Skilling, D.D. 1994. Butternut - strategies for managing a threatened tree. Gen. Tech. Rep. NC-165. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station and Northeastern Area State and Private Forestry. 7 p.

Describes guidelines for managing butternut in the presence of butternut canker, including when to retain or remove trees. Offers guidelines for identifying potential resistant trees. Illustrated.

153. Ostry, M.; Skilling, D.; Pijut, P. 1993. Butternut canker: present impact and prospects for the future. In: Proceedings, 6th International congress of plant pathology; 1993 July 28-August 6; Montréal, Québec, Canada. Ottawa, Ontario, Canada: National Research Council Canada: 126. [Abstract].

Describes the impact of butternut canker and efforts to preserve the butternut species.

154. Ostry, M.E.; Ellingson, B.; Seekings, D.; Ruckheim, W. 2003. The need for silvicultural practices and collection of *Juglans cinerea* germplasm for species conservation. In: Van Sambeek, J.W.; Dawson, J.O.; Ponder, F., Jr.; Loewenstein, E.F.; Fralish, J.S., eds. Proceedings of the 13th Central hardwood forest conference; Urbana-Champaign, IL. Gen. Tech. Rep. NC-234. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 601-606.

Describes the history and impact of butternut canker. Discusses the need for conservation strategies for recovery of butternut and establishment of clonal archives. Describes a regeneration study testing current management guidelines and monitoring natural regeneration and planted seeds and seedlings.

155. Packard, Alpheus S. 1890. Insects injurious to the butternut (*Juglans cinerea*). In: 5th report of the United States Entomological Commission on insects injurious to forest and shade trees. Washington, DC: U.S. Department of Agriculture, Government Printing Office: 337-342.

A list of 13 insects found to feed on butternut. Includes descriptions and drawings.

156. Patterson, R. 1993. Butternut blues. American Forests. 99(7,8): 22, 57.

Describes the loss of butternut to the butternut canker disease. Describes factors that may make this disease more devastating than other well-known tree diseases.

157. Peattie, Donald Culross. 1950. Butternut - *Juglans cinerea* Linnaeus. In: A natural history of trees of eastern and central North America. Boston, MA: Houghton Mifflin: 119-121.

Describes various tree characteristics including nuts, wood, and uses of butternut.

158. Pijut, P.M. 1993. Regeneration of *Juglans cinerea* through somatic embryogenesis. In Vitro Cellular and Developmental Biology. 29A(3 Part II): 69A. [Abstract].

Somatic embryogenesis was induced in vitro from immature butternut cotyledons. Somatic embryos were induced to germinate at low frequency.

159. Pijut, P.M. 1997. Micropropagation of *Juglans cinerea* L. (butternut). In: Bajaj, Y.P.S., ed. Biotechnology in agriculture and forestry - high-tech and micropropagation V. Berlin: Springer-Verlag: 345-357.

Butternut was successfully cultured in vitro using axillary bud culture. Axillary buds elongated, rooted, and acclimatized to ex vitro conditions. Somatic embryogenesis was induced using cotyledons of immature butternut seeds. Somatic embryos were induced to break dormancy and germinated at a low frequency.

160. Pijut, Paula M. 1993. Somatic embryogenesis in butternut, *Juglans cinerea*. Canadian Journal of Forest Research. 23: 835-838.

Cotyledons were excised from immature butternut fruits and were cultured in vitro. Somatic embryos were produced, and the embryogenic callus was maintained for one year.

161. Pijut, Paula M. 1994. Micropropagation of butternut, *Juglans cinerea*. HortScience. 29(5): 431. [Abstract].

Butternut was cultured in vitro via axillary buds of young seedlings. Buds elongated, rooted, and were acclimated ex vitro.

162. Pijut, Paula M. 1999. Somatic embryogenesis from immature fruit of *Juglans cinerea*. In: Mohan Jain, S.; *et al*., eds. Somatic embryogenesis in woody plants. The Netherlands: Kluwer Academic Publishers: 415-429.

Somatic embryogenesis was induced in vitro from immature butternut cotyledons. Best results were obtained from explants collected 8-9 weeks postanthesis and cultured in the dark on DKW medium containing BA, 2,4D, and glutamine. Somatic embryos were induced after removal of plant growth regulators. Embryos were induced to germinate at low frequency.

163. Pijut, Paula M.; Barker, Melanie J. 1999. Propagation of *Juglans cinerea* L. (Butternut). HortScience. 34(3): 458-459.

Hardwood and softwood cuttings of butternut at differing growth stages were tested for rooting success. Softwood cuttings rooted at greater frequencies than hardwood cuttings, up to 70% when collected in early June and treated with 74 mm IBA.

164. Pijut, Paula M.; Moore, Melanie J. 2002. Early season softwood cuttings effective for vegetative propagation of *Juglans cinerea*. HortScience. 37(4): 697-700.

Hardwood and softwood cuttings of butternut at differing growth stages were tested for rooting success. Softwood cuttings rooted at greater frequencies than hardwood cuttings, up to 88% when collected in early June and treated with 74 mm IBA. Rooted cuttings were successfully overwintered and field planted.

165. Porter, B.A. 1932. Insects affecting northern nuts. Annual Report of the Northern Nut Growers Association. 23: 74-80.

Describes a number of insect pests affecting nut trees, including the butternut curculio and the walnut husk maggot. Includes suggestions for chemical controls.

166. Prey, A.J.; Kuntz, J.E. 1982. The distribution and impact of butternut canker in Wisconsin. In: Black walnut for the future. Gen. Tech. Rep. NC-74. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 23-26.

Butternut trees from throughout Wisconsin were examined for evidence of butternut canker. In several counties in northeastern Wisconsin no infected trees were found, but in southwestern counties as many as 80% of the butternuts were infected and 32% were dead.

167. Prey, Allen J.; Kuntz, James E.; Ostry, Michael E. 1997. Butternut canker: cause, spread and control. In: Procházkova, Z.; Sutherland, J.R., eds. Proceedings of the ISTA tree seed pathology meeting; 1996 October 9-11; Opocno, Czech Republic. Zurich, Switzerland: International Seed Testing Association: n.p.

Describes the range, fungal biology, and transmission of butternut canker. Of special concern is the problem of seedborne transmission.

168. Rainville, André; Innes, Louise; Colas, Fabienne; Bettez, Michèle; Mercier, Stéphan. 2001. Butternut canker in Quebec: a 5-year history that led to seed treatments. In: Tree Seed Working Group News Bull. 34. [city and state unknown]: Canadian Tree Improvement Association: 14-16.

Butternut seedlings in conservation plantings were found affected by butternut canker. The disease was shown to be seedborne in butternut and black walnut. Decontamination tests showed that soaking seeds in boiling water for 1 minute was effective in killing the fungus while protecting seed viability.

169. Reed, C.A. 1931. Varieties of nuts for northern planting. Annual Report of the Northern Nut Growers Association. 22: 77-109.

Offers suggestions for proper site and spacing for growing nut trees. Lists named varieties of butternut and other nut tree species.

170. Reed, C.A. 1932. The year in nut culture (northeastern states). Annual Report of the Northern Nut Growers Association. 23: 143-152.

Describes the establishment of several new research orchards in the region. Lists available named varieties, including butternut.

171. Reed, C.A. 1934. Varieties of nut trees for the northernmost zone. Annual Report of the Northern Nut Growers Association. 25: 87-107.

Describes the difficulties in producing nuts in northern areas, and lists recommended varieties of black walnuts, butternuts, and hickories for the north.

172. Reed, C.A. 1936. Natural walnut hybrids in the East. Annual Report of the Northern Nut Growers Association. 27: 30-40.

Describes a number of specimen trees that were known or suspected Juglans *hybrids in the eastern U.S. Includes butternut/Persian walnut and butternut/ Japanese walnut hybrids.*

173. Rehder, Alfred. 1962. Juglandaceae. In: Manual of cultivated trees and shrubs hardy in North America - exclusive of the subtropical and warmer temperate regions. 2d ed. New York, NY: The MacMillan Co.: 117-124.

Describes the taxonomic characteristics of trees in the Juglandaceae family, including butternut.

174. Renlund, Donald W., comp., ed. 1971. Forest pest conditions in Wisconsin, annual report 1971. Madison, WI: Wisconsin Department of Natural Resouces: 26-28.

Widespread dying of butternut was reported and investigated. Aerial surveys, mapping, and disease sampling were performed. The disease was identified as Melanconis.

175. Rink, George. 1990. *Juglans cinerea* L. Butternut. In: Burns, Russell M.; Honkala, Barbara H., tech. coords. Silvics of North America. Washington, DC: U.S. Department of Agriculture, Forest Service: 386-390.

Describes the growth characteristics, habitat preferences, and diseases of butternut.

176. Rosengarten, Frederic, Jr. 1984. Butternuts. In: The book of edible nuts. New York, NY: Walker and Co.: 279-281.

Briefly describes butternut tree and nut characteristics, and past uses of the trees.

177. St. Jacques, Claude; Labrecque, Michel; Bellefleur, Pierre. 1991. Plasticity of leaf absorbance in some broadleaf tree seedlings. Botanical Gazette. 152(2): 195-202.

Five species of tree seedlings of varying shade tolerances were placed in the shade or in the open. Leaf absorbance was measured in early June and in late July. Butternut, a shade intolerant species, had little difference in absorbance between shaded and sunlit leaves. Sugar maple, a very shade tolerant species, quickly developed significant differences in absorbance between shaded and sunlit leaves.

178. Sajan, R.; Melbourne, S.; Czerwinski, E. 1994. Butternut canker. In: Results of forest insect and disease surveys in the southern region of Ontario. Inf. Rep. O-X-429. Ontario, Canada: Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre: 21-23.

Reports the results of surveys done in southern Ontario. Butternut canker was detected at several sites. A map of confirmed canker locations is included.

179. Schaefer, Mark, ed. 1998. ECSONG: a nut growers' manual for eastern Ontario. Eastern Chapter Society of Ontario Nut Growers. [Available online: http://www.ecsong.ca/manual.html].

Describes nut bearing trees and shrubs in eastern Canada, and provides recommendations for successful propagation and growth. Includes a section on butternut.

180. Schlarbaum, Scott E.; Hebard, Frederick; Spaine, Pauline C.; Kamalay, Joseph C. 1997. Three American tragedies: chestnut blight, butternut canker, and Dutch elm disease. In: Britton, Kerry O., ed. Proceedings, Exotic pests of eastern forests; 1997 April 8-10; Nashville, TN. [city and state unknown]: Tennessee Exotic Pest Plant Council: 45-54.

American chestnut, butternut, and American elm are examples of trees that have been devastated by exotic fungal diseases. Describes the impact of butternut canker and current research and conservation initiatives.

181. Schroeder, J.G. 1972. Butternut...an American wood. FS-223. Athens, GA: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 6 p.

A description of butternut's range, growth habits, and wood properties.

182. Schuler, Thomas M. 1997. Temporal variation in woody species composition from 1922 to 1996 in a second-growth Appalachian forest. In: Pallardy, S.G.; Cecich, R.A.; Garrett, H.E.; Johnson, P.S., eds. Proceedings, 11th Central hardwood forest conference; 1997 March 23-26; Columbia, MO. Gen. Tech. Rep. NC-188. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 352. [Abstract].

A comparison of present species composition with a 1922 inventory in West Virginia shows a decline in several species including black walnut and butternut.

183. Schweitzer, Dale F. 1982. Field observations of foodplant overlap among sympatric *Catocala* feeding on Juglandaceae. Journal of the Lepidopterists' Society. 36(4): 256-263.

Several species of the moth genus Catocala *feed on hickory, walnut, and butternut. In this study trees were inspected for larvae and eggs, and larvae were raised on various leaves.* Catocala neogama *was most common on butternut.*

184. Seliskar, Carl E. 1973. Association of a mycoplasmalike organism with walnut bunch disease. In: Abstracts of papers of the 2d International Congress of Plant Pathology: Colloquium 37: virus diseases of small-fruit plants; 1973 September 5-12; Minneapolis, MN. International Society for Plant Pathology: n.p. [Abstract 0933].

Walnut bunch disease affects Japanese, English, and black walnut, and butternut. It was formerly thought to be caused by a virus. Observations revealed a mycoplasmalike organism in diseased tissues.

185. Seliskar, Carl E. 1976. Mycoplasmalike organism found in the phloem of bunch-diseased walnuts. Forest Science. 22: 144-148.

Walnut bunch disease occurs on Japanese, Manchurian, English, and black walnut, and butternut. Electron microscopy revealed the presence of a mycoplasmalike organism in diseased but not healthy tissue. No virus particles were found.

186. Senter, S.D.; Horvat, R.J.; Forbus, W.R. 1983. Comparative GLC-MS analysis of phenolic acids of selected tree nuts. Journal of Food Science. 48: 798-799, 824.

Phenolic acids were extracted from a number of species of tree nuts and analyzed for levels of individual compounds. Butternuts had the lowest total concentration of phenolic acids at 0.31 μg/g, mostly from gallic acid.

187. Sinclair, Wayne A.; Lyon, Howard H.; Johnson, Warren T. 1987. *Sirococcus* canker of butternut. In: Diseases of trees and shrubs. Ithaca, NY: Comstock Publishing Associates: 132-133.

Describes butternut canker symptoms, disease development in the tree, fungal biology, and spread. Illustrated.

188. Smith, Huron H. 1923. Ethnobotany of the Menomini Indians. Bulletin of the Public Museum of Milwaukee. 4(1): 1-174.

Lists plants and trees used by the Menomini Indians. Butternut syrup was used as a physic, nuts were eaten, and husks and bark were used for brown and black dyes.

189. Smith, Huron H. 1928. Ethnobotany of the Meskwaki Indians. Bulletin of the Public Museum of Milwaukee. 4(2): 175-326.

Lists plants and trees used by the Meskwaki Indians. Butternut bark was used as a cathartic and the nuts were used for food.

190. Smith, Huron H. 1932. Ethnobotany of the Ojibwe Indians. Bulletin of the Public Museum of Milwaukee. 4(3): 327-525.

Lists plants and trees used by the Ojibwe Indians. Butternut was used for food and for a brown or black dye.

191. Smith, Huron H. 1933. Ethnobotany of the Forest Potawatomi Indians. Bulletin of the Public Museum of Milwaukee. 7(1): 1-230.

Lists plants and trees used by the Forest Potawatomi Indians. Butternut bark was used as a physic and tonic and the nuts were used for food.

192. Smith, Norman F. 1952. Butternut...*Juglans cinerea*, L. Michigan Conservation. September-October: 23-24.

Describes the growth characteristics and uses of butternut.

193. Soják, Dušan. 1996. Produkcia dendromasy vybratých ihličnatých a tvrdých listnatých drevín podunajskej nížiny: Production of dendromass of selected needle-leaved trees and hard-wooded broadleaves in the Danubian lowland. Zprávy Lesnického Výzkumo. 41(2): 17-22.

Article in Slovakian with an English abstract. Compares growth and biomass production of butternut, black walnut, and several other species in areas of full soil preparation.

194. Soják, Dušan; Réh, Roman. 1998. Možnosti pestovania a využitia orecha popolavého (*Juglans cinerea* L.) v intenzívnych porastoch: Possibilities of cultivation and use of butternut (*Juglans cinerea* L.) in intensive stands. Lesnícky časopis - Forestry Journal. 44(5): 345-360.

Article in Slovakian with an abstract and summary in English. This study was aimed at evaluating butternut as a suitable crop tree in their area of Slovakia. A 40-year-old stand was evaluated for biomass and veneer production. Butternut was recommended as a suitable tree for intensively managed stands.

195. Solomon, Allen M.; Bartlein, Patrick J. 1992. Past and future climate change: response by mixed deciduous-coniferous forest ecosystems in northern Michigan. Canadian Journal of Forest Research. 22: 1727-1738.

Prehistoric pollen records in Upper Michigan were used to develop climate change models. These models were used to simulate potential future climate and vegetation changes. Butternut was predicted to reappear after the decline of other species created opportunites for regeneration.

196. Spaine, P.; McElreath, S.; Jolley, L. 2001. Double-stranded RNA analysis of *Sirococcus* isolates from butternut cankers. Supplement to Phytopathology. 91(6): S83. [Abstract].

A continuation of an earlier study found dsRNA occurs more often in isolates from Southeastern States than from the North. A doublet of between 1.5 and 2.5 kbp was common to most dsRNA positive isolates.

197. Spaine, P.; Schlarbaum, S.; McElreath, S. 1999. Detection of dsRNA in the butternut canker fungus. Supplement to Phytopathology. 89(6): S74. [Abstract].

The relationship between healing butternut cankers and double-stranded RNA positive strains of Sirococcus *was studied. DsRNA was found in samples from several sites.*

198. Spaine, P.; Anderson, R.; Young, C.; Schlarbaum, S. 1997. Testing methods of disease resistance screening for butternut canker. Supplement to Phytopathology. 87(6): S93. [Abstract].

Butternut seed from three locations revealed no Sirococcus *infection. Seedlings were wound inoculated with the fungus, resulting in no differences in wound size. Logs were inoculated with the fungus and later examined to reveal some differences between susceptible and resistant hosts.*

199. Spurgeon, Charles A. 1995. 1995 butternut observations. Annual Report of the Northern Nut Growers Association. 86: 131-132.

Nut characteristics such as cracking ability and percent kernel were evaluated for several varieties.

200. Stanford, Alice M.; Harden, Rachel; Parks, Clifford R. 2000. Phylogeny and biogeography of *Juglans* (Juglandaceae) based on matK and ITS sequence data. American Journal of Botany. 87(6): 872-882.

Using DNA analysis techniques, 15 Juglans *and related species were investigated for phylogenetic and biogeographic relationships. Butternut consistently grouped with* Cardiocaryon, *the oriental walnuts.*

201. Stefan, Susan J.; Warmund, M.R.; Shaffer, W.H., Jr.; Millikan, D.F. 1984. Propagation of butternut, *Juglans cinerea* L., by the Beineke side bud graft. Annual Report of the Northern Nut Growers Association. 75: 76-80.

Several named varieties of butternut were grafted using the Beineke side graft. Success was 52% overall, with wide variation between varieties. Results were better overall than with bench grafting.

202. Strode, Donald D. 1977. Butternut/*Juglans cinerea* L. In: Halls, Lowell K., ed. Southern fruit-producing woody plants used by wildlife. Gen. Tech. Rep. SO-16. U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station: 149-150.

Lists general characteristics of the butternut tree, along with its utilization by animals and humans.

203. Taylor, J. Lee; Perry, Ronald L. 1986. Growing nuts. North Cent. Reg. Ext. Publ. #237. East Lansing, MI: Cooperative Extension Service, Michigan State University. 27 p.

Describes growing nut trees in a home or orchard setting. Covers most common nut trees, including butternuts. Includes sections on planting and maintaining an orchard, harvesting and processing nuts, and propagation and grafting methods.

204. Timmons, Randall G.; Smiles, Wayne A.; Dawson, Jeffrey O. 1993. Planting method and herbicide treatment influence direct seeding success of some central hardwood tree species. For. Res. Rep. 93-1. Urbana-Champaign, IL: Illinois Agricultural Experiment Station, University of Illinois. 7 p.

A mixture of hardwood tree seeds, including butternut, was broadcast in a prepared field and subjected to several incorporation and herbicide treatments. Overall, seeding success for butternut was 1%. Double disking produced the best success for butternut at 5%. Herbicide treatments reduced overall success.

205. Tisserat, Ned Andrew. 1982. Epidemiology of butternut canker. Madison, WI: University of Wisconsin. 122 p. Ph.D. dissertation.

Describes the fungal biology and spore dispersal of the fungus causing butternut canker. Spores were released throughout the growing season during rain, and caused new infections after dissemination in runoff or rain splash. Spore longevity was increased by cool temperature and high humidity, up to 35% after 8 hours. Disease incidence increased exponentially in an isolated butternut plantation.

206. Tisserat, N.A.; Kuntz, J.E. 1982. Epidemiology of butternut canker. In: Black walnut for the future. Gen. Tech. Rep. NC-74. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 18-22.

Describes the fungal biology and spore dispersal of the fungus causing butternut canker. Spores were released throughout the growing season during rain, and caused new infections after dissemination in runoff or rain splash. Spores were dispersed up to 30 m from infected trees. Infection occurred in potted seedlings placed under infected trees from late July to October.

207. Tisserat, N.; Kuntz, J.E. 1983. Dispersal gradients of conidia of the butternut canker fungus in a forest during rain. Canadian Journal of Forest Research. 13: 1139-1144.

Spores of the butternut fungus were released throughout the growing season during rain, and caused new infections after dissemination in runoff or rain splash. Spores were dispersed up to 40 m from infected trees. Concentrations of conidia decreased exponentially with increasing distances from the inoculum source.

208. Tisserat, N.; Kuntz, J.E. 1983. The etiology and epidemiology of butternut canker. Annual Report of the Northern Nut Growers Association. 74: 30-36.

Describes the symptoms and fungal biology of the butternut canker disease. Also descibes the historical process by which researchers discovered the causal organism.

209. Tisserat, N.; Kuntz, J.E. 1983. Longevity of conidia of *Sirococcus clavigignenti-juglandacearum* in a simulated airborne state. Phytopathology. 73(12): 1628-1631.

Butternut canker conidia were tested for longevity on spiderweb frames. Cool temperatures (13° C) and high humidity (9.7 mb VPD) resulted in 81% survival after 32 hours. In the field the greatest survival was 35% after 8 hours on a cool, rainy day.

210. Tisserat, N.; Kuntz, J.E. 1984. Butternut canker: development on individual trees and increase within a plantation. Plant Disease. 68(7): 613-616.

Butternut canker incidence increased exponentially from 1978 to 1983 in an isolated butternut plantation. Cankers developed first on branches of the lower crown, followed by branch mortality and trunk cankers. The fungus continued to sporulate on dead trees for 20 months.

211. Tisserat, N.; Nicholls, T.H.; Kuntz, J.E. 1981. Spore liberation and dispersal of *Sirococcus clavigignenti-juglandacearum*. Phytopathology. 71(2): 261. [Abstract].

The butternut canker fungus extruded spores from April to October during humid conditions. Spores were deposited on slides only during rainfall, with concentrations decreasing exponentially at increasing distances from the source of inoculum.

212. Truax, Benoit; Gagnon, Daniel. 1993. Effects of straw and black plastic mulching on the initial growth and nutrition of butternut, white ash and bur oak. Forest Ecology and Management. 57: 17-27.

The effects of mulching materials on the growth and nutrition of seedlings of butternut, white ash, and bur oak were studied. Butternut did not respond positively to mulch treatment. Butternut had the highest foliar concentration of nitrogen.

213. Twardus, Daniel B. 1995. Forest health assessment for eastern hardwood forests. In: Proceedings, 10th Central hardwood forest conference; 1995 March 5-8; Morgantown, WV. Gen. Tech. Rep. NE-197. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 3-10.

A report on the health of a number of eastern tree species, including butternut.

214. U.S. Department of Agriculture. 1937. Nuts. In: Yearbook of agriculture. Washington, DC: United States Government Printing Office: 857-877.

Describes characteristics of several nut species including butternut. It includes information on pollination and breeding.

215. U.S. Department of Agriculture. 1993. Butternut. In: Forest health assessment for the Northeastern Area. NA-TP-01-95. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area and Northeastern Forest Experiment Station: 12-13.

A report on the health of a number of eastern tree species, including butternut.

216. Van Manen, Frank T.; Clark, Joseph D.; Schlarbaum, Scott E.; Johnson, Kristine; Taylor, Glenn. 2002. A model to predict the occurrence of surviving butternut trees in the southern Blue Ridge Mountains. In: Scott, J. Michael; Heglund, Patricia J.; Morrison, Michael L.; *et al*., eds. Predicting species occurrences - issues of accuracy and scale. Washington, DC: Island Press: 491-498.

A GIS-based database of known butternut locations from the Great Smoky Mountains National Park was used to create a model to predict other probable butternut locations. Surveys of a sample of predicted locations revealed butternuts growing in a number of those locations.

217. Van Sambeek, J.W.; Ostry, Michael E.; Zaczek, James J. 2003. Survival and growth of deep-planted, in-leaf grafts in a germplasm repository of canker-resistant butternut. In: Van Sambeek, J.W.; Dawson, J.O.; Ponder, F., Jr.; *et al*., eds. Proceedings of the 13th Central hardwood forest conference; 2002 April 1-3; Urbana-Champaign, IL. Gen. Tech. Rep. NC-234. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 519-522.

Grafted butternuts were field planted, and survival and growth were monitored for seven growing seasons. Mortality was high, and affected by field location, clone, and planting depth. Height growth of deep planted grafts exceeded that of more shallowly planted grafts.

218. Vidakovic-Cifrek, Zeljka; Jelencic, Biserka; Regula, Ivan. 1997. Increasing of serotonin content in seeds of *Juglans nigra* L. and *Juglans cinerea* L. during ripening. Periodicum Biologorum. 99(1): 103-106.

Nuts of several Juglans *species are known to contain high levels of serotonin. Extracts of black walnut and butternut at differing maturity stages were examined for serotonin levels. Both showed increasing levels over the ripening period.*

219. Von Althen, F.W. 1980. Five-year survival and growth of sixteen hardwood species planted in different mixtures. Rep. 0-X-313. Sault Ste. Marie, Ontario, Canada: Department of the Environment, Canadian Forestry Service, Great Lakes Forestry Research Centre. 8 p.

A mixture of 12 species of hardwood seedlings was planted either 12 of one species grouped per row or completely at random. After 5 years, butternuts had 92% survival in either treatment and were slightly taller in the 12 per row treatment than in the random treatment.

220. Wallace, B.D. 1934. Letter on the culture of butternuts and black walnuts. Annual Report of the Northern Nut Growers Association. 25: 113-114.

Describes the performance of butternut in Manitoba. By retaining only the hardiest trees in a plantation and collecting seed from them, the author had distributed butternuts throughout central Canada.

221. Watts, R.L. 1941. The place of the butternut in northern nut culture. Annual Report of the Northern Nut Growers Association. 32: 89-91.

Discusses the lack of interest in butternut and offers several reasons why butternut should attract more attention and study. These include the nutritive value of the nuts, tree hardiness, wood quality, and the nuts' use as a wildlife food.

222. Watts, R.L. 1944. Grow more butternuts. Annual Report of the Northern Nut Growers Association. 35: 58-59.

Author lists a number of named varieties of butternuts, and encourages further study and propagation.

223. Weschcke, Carl. 1953. Growing nuts in the North. St. Paul, MN: Webb Publishing Co. 124 p.

Author describes his experiences growing many types of nut trees. One chapter is devoted to butternut, providing descriptions of growth characteristics, wood properties, nut properties, and propagation.

224. Whealy, Kent; Demuth, Steve, eds. 1993. Fruit, berry and nut inventory. 2d ed. Decorah, IA: Seed Saver Publications. 518 p.

Compiles lists of varieties of fruits and nuts available through mail order in the U.S. Lists 16 available butternut varieties.

225. Wilson, Louis F.; Corneil, Jeffrey A. 1979. The butternut curculio on some hybrid walnuts in Michigan. In: Walnut insects and diseases: workshop proceedings; 1978 June 13-14; Carbondale, IL. Gen. Tech. Rep. NC-52. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 35-38.

A plantation containing various Juglans *species and hybrids was observed for butternut curculio damage. Butternut was rated low in susceptibility, and butternut/Japanese walnut hybrids were rated as moderately susceptible.*

226. Wilson, Louis F.; Corneil, Jeffrey A.; Lemmien, Walter A. 1979. Susceptibility and injury of some hybrid walnuts by the butternut curculio (Coleoptera: Curculionidae). The Great Lakes Entomologist. 12(1): 17-21.

Susceptibility to the butternut curculio was studied in a mixed Juglans *plantation in Michigan. In general, trees with Japanese walnut parentage were most susceptible, and butternut, along with black walnut and Persian walnut, was among the least susceptible.*

227. Wisconsin Conservation Department. 1967. Forest pest conditions in Wisconsin. Madison, WI: Wisconsin Department of Natural Resources. 67 p.

First report of butternut dieback and canker in several counties of Wisconsin.

228. Woodroof, Jasper Guy. 1979. Butternut. In: Tree nuts: production, processing, products. 2d ed. Westport, CT: Avi Publishing Company, Inc.: 659-661.

Describes some of the positive qualities of butternut, along with its disease problems. Lists named varieties and grafting techniques used.

229. Yabloko, A.S. 1936. Inter-species hybridization of walnuts. Soviet Subtropics. 5: 53-60.

Article in Russian with an English summary. Most major Juglans *species were tested for inter-species hybridization. The Manchurian walnut hybridized most easily with other species, including butternut, which produced an average of 28% hybrid fruit.*

230. Young, James A.; Young, Cheryl G. 1992. Juglandaceae - walnut family. In: Dudley, Theodore R., ed. Seeds of woody plants in North America. Revised. Portland, OR: Dioscorides Press: 184-187.

Discusses nut harvesting, hulling, stratifying, and planting of most of the common Juglans *species, including butternut.*

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