Bibliography of

Walnut

Supplement No. 2

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FOREWORD

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FOREWORD

Since publication of "An Annotated Bibliography of Walnut and Related Species," USDA Forest Service Research Paper NC-9, by David T. Funk in 1966, and "Annotated Bibliography of Walnut--Supplement No. 1," USDA Forest Service Research Paper NC-70, by Martha K. Dillow and Norman L. Hawker in 1971, we have accumulated an additional 223 literature references dealing with Juglans ecology, silviculture, and timber products. This supplement is an attempt to update the previous bibliographies by including citations that were unintentionally omitted in the original publications and those published since 1971.

The bibliography is arranged in alphabetical order by author. An index provides a list of items by subject matter. More than four-fifths of the items are annotated. Most of the remainder were either not seen by the author or were in a foreign language, with no English summary or translation available.

We would appreciate being notified of any errors in the list and also would be glad to know of any publications that were omitted and should be included in a future supplement.
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1Numbers appearing in bold-face type refer to publications containing information on J. nigra; numbers appearing in italics refer to publications that do not contain any information on J. nigra.
BIBLIOGRAPHY OF WALNUT--SUPPLEMENT NO. 2

Compiled by Martha K. Dillow


Draws attention to the merits of Juglans nigra, now out of fashion in France, and briefly gives advice on the establishment and treatment of plantations of this species.


The bark contained substantial mineral salts that probably have no direct effect as far as removal of usual salivary deposits on teeth is concerned. Various extractives produced remarkable masking effect on tartar that was also slightly dissoluble in extractives. The value of the bark as a local dentifrice lies in its antiseptic and antibacterial property in oral hygiene.


A crude extract of the bark of Juglans regia Linn tested against 13 species of fungi showed selective fungistatic action against some species of the dermatophytes tested.


The decomposition rates of the finely ground woods and barks of nine species of hardwoods were determined by measuring CO₂ release in the laboratory at two nitrogen levels. The following species were studied: black oak, white oak, red oak, post oak, hickory, red gum, yellow-poplar, chestnut, and black walnut. The variations in the rates of CO₂ release from the woods were not great, but hickory and black walnut barks decomposed much slower than the other barks. The hardwoods were attacked much more readily than most of the softwoods used in an earlier study; consequently, more nitrogen was required by the microorganisms that decomposed them.


Herbicide treatment using 3 to 8 lb/acre of active simazine is recommended for weed control in black walnut plantations. The most favorable cost-growth ratio was obtained with the 3 lb/acre simazine treatment. Matching with black polyethylene is recommended for plantings where costs are less important than assured success.


Cold storage in moist sand at 30°F for 10 mo improved germination rate of black walnut seed over that of seed stored for 7 or 31 mo. In 2 different years, southern Ontario seed stratified for 10 mo yielded 58 to 61 percent germination within 3 weeks after sowing.


Not seen.


Not seen.


Gives details from studies on apical and lateral vegetative buds and flower buds of early- and late-fruiting cultivated forms in the Ukraine.

The efficient production and marketing of walnut products is dependent upon aid available to the grower. Many sources and kinds of aid exist including on-the-ground technical assistance, publications, seminars, and incentive payments. By carefully analyzing his needs and soliciting assistance from the proper source, each grower can better prepare himself for a successful walnut enterprise.


Simazine at 5 kg/ha, applied in the autumn 2 weeks after sowing, did not reduce the germination of walnuts (Juglans regia) but increased the stem and root growth and the leaf area of the seedlings. Weed control was very satisfactory; the weight of surviving weeds was only one-half as much as those regrowing after repeated hand hoeing.


In a 2-yr trial with Payne walnuts to assess the beneficial effects of controlling aphids (Insecticides not specified), aphid infestations of untreated control trees resulted in crop losses of 10 and 25 percent in the first and second year, respectively, and a 25 percent reduction in the number of large, sound nuts compared with treated trees. The numbers of off-grade nuts were also increased by 10 percent and diamond kernel nuts were reduced by 11.6 percent. The economic advantages resulting from aphid control are noted. Elsewhere, walnut aphids were effectively controlled by the wasp Trioxys pallidus.


Unfortunately, the selection of superior black walnut trees in mixed, uneven-aged stands does not permit the use of comparison trees as in pure even-aged stands. A point system based on knowledge of variation within a species has been developed and applied to black walnut in Indiana. Trees are not compared to others within the stand but to those throughout the geographic area of selection.


The genetic improvement of Indiana black walnut has progressed along two important fronts: (1) progeny testing of superior tree selections, and (2) clonal development and testing of these selections. Prior to clone-bank flowering, half-sib testing of superior individuals comprised the bulk of our work. Nursery, 1-, 2-, and 3-yr-old outplanting results have shown surprisingly high inheritance and genotypic and phenotypic correlations on growth parameters. In addition, family performance compared with the commercial check has been outstanding. At this time the clonal program utilizes 106 grafted clones. Analysis of variance and heritability estimates on foliation date, defoliation date, height, diameter, sweep, crook, branch angle, branch number, and anthracnose resistance show striking differences.


Gives a detailed illustrated description of development from germination to the end of the first year.

Serotonin was found in the walnut embryo and cotyledons but not elsewhere in the seed or mature plant. Serotonin formation appears not to be a special type of nitrogen storage but a way of ammonia detoxification in which ammonia from protein amino acid degradation is incorporated into serotonin via tryptophan.


Several diseases that can cause considerable damage to black walnut trees are discussed. Walnut root rots are serious in a number of nurseries where black walnut are grown. Anthracnose is the most serious foliage disease of black walnut, and some methods for its control are suggested. Other diseases discussed include walnut bunch, heart rots, and cankers.


Data on leaf flush in black walnut were collected in three provenances and two progeny tests at three widely separated locations. In all plantations, trees from southern sources flushed earlier than trees from northern sources. Trees from sources that flushed early one year also flushed early the next. In a progeny test on two sites, the trees from families that flushed early on the upland site also flushed early on the bottomland site.


In an effort to obtain information useful in establishing walnut plantations, patterns of growth and phenological characteristics of trees originating in different geographic locations have been observed. No geographic area produced unusually large or small seed. Trees from the southern sources generally flushed earlier, dropped their leaves later, grew taller, and had more lateral buds on the current year's terminal than trees from northern sources.


A "new twist" procedure for eliminating forks and multiple tops in young black walnut trees involves using weaker shoots as supports for straightening the most promising terminal. Judicious bending, tapping, and clipping on young trees can increase the chances of producing high-quality boles.


Research dealing with genetic variation and selection in black walnut has confirmed the idea of wide genetic diversity. Growth, form, leaf flush, leaf fall, and period of growth are genetically variable. Leaf flush usually begins 1 day earlier for every 65 mi south of the planting site that seed is collected. In field tests, leaf fall is delayed about 1 day for every 65 mi to the south that seed is collected. Trees from as far as 200 mi south of the planting site generally grow as large or larger in height and diameter than trees from local or northern sources.


At age 8, survival of black walnut trees was not related to latitude of the source at six out of eight locations. Trees from as far as 200 mi south of the planting generally grew as large or larger than trees from local or northern sources.


Growth, form, and phenological characters were evaluated in young black walnut trees. Analysis of variance revealed that most characters showed source differences while only a few characters showed family within-source differences. Heritability estimates
indicate that the potential for genetic gain for growth, flushing, and leaf fall characters are good.


The major phases essential for developing a black walnut seedling seed orchard include: (1) defining the planting and seed collection areas, (2) collecting seed for the seed orchard trees, (3) selecting the orchard site, (4) establishing the orchard, (5) caring and maintaining the orchard, (6) selecting superior phenotypes and thinning the orchard, and (7) planning for the next-generation orchard.


The use of walnut increased from 1933 to the mid-1960's, then probably peaked-out between 1968 and 1969. The proportion of walnut logs used for veneer has been increasing during the last 2 decades while the proportion used for lumber has been declining. Most export logs are cut into veneer. The demand for walnut logs has varied considerably during the 1960's, but the general trend of log prices has been sharply upward. Rising prices with fluctuating demand indicate a scarcity of high-quality walnut, a need for more efficient and complete utilization of the walnut resource, and the necessity for reducing costs in domestic manufacturing of walnut products so they can remain competitive with substitutes and foreign products.


Although some black walnut orchards were started in earlier years, production planting for the multiple cropping of nuts, saw logs, and agricultural crops began in Arkansas Soil Conservation Districts in early 1972. Orchard sites were selected by use of the "Woodland Suitability Group" system as used by the Soil Conservation Service. Krajicek's formula was used as a basis for spacing orchards. The planting techniques described assured good survival the first year despite a drought.


Not seen.


The soils are thought to be young.

32. Botman, K. S. 1968. [NATURAL RESTORATION OF SOIL FERTILITY ON TERRACES OF MOUNTAIN SLOPES.] Pochvovedenie 4: 77-83. [In Russian with English summary.]

In the upper horizon of brown mountain-forest soil in the Tashkent region, total porosity, percent content of water-stable aggregates, and percent contents of N and water-soluble humus in the upper horizon were greater under 65-yr-old Persian walnut or English oak planted on terraces than those in the soil between the terraces. Oak litter should be removed from the terrace once in 5 yr, but walnut litter should be retained.


Black walnut is scarce in hardwood stands of the southeast but good potential exists for growing more quality timber. Recent silvicultural knowledge coupled with research findings in other regions make the growing of black walnut practical. Problems, research results, and current recommendations are given for seed collection, nursery practices, site selection and preparation, plantings, and cultural practices. Silvicultural goals are stated and the problems needing further research are defined.


Transplanting of seedling is preferred over direct seeding, especially when large seedlings, at least 3/4-in. caliper, are
used. Planting on bedded sites and use of herbicides to control weeds are recommended.


Missouri's black walnut tree improvement action program is cooperative between the USDA Forest Service and the Forestry Division of the Department of Conservation. The program consists of a long-term single tree selection-progeny test-seed orchard (SPSO) development phase, and a short-term phase. The short-term phase includes super-sized seedling production, seed collection, and seedling distribution to specific geographic zones, concurrent provenance testing, and seed production area (SPA) development.


Presents a summary of information needed to establish and care for black walnut plantations. Subjects discussed include: how to choose a planting site, spacing, seedling selection and care, when and how to plant seedlings or seed, benefits from interplanted species, the need for and how to control weeds, and how to prune to promote apical dominance, and clear stem pruning.


Weeds are unwanted plants that seriously compete with young black walnut for essential growth factors—space, light, moisture, and nutrients. Weed control is very important in plantations to assure successful establishment and early growth of walnut. Mechanical methods are feasible for weed control, but chemical control with pre- or postemergence herbicides is normally more effective and economical. Herbicides can be applied broadcast over entire areas or restricted to stripes or spots adjacent to planted trees. Users of herbicides should be familiar with herbicide regulations and strictly adhere to precautions and directions listed on the label.


For years the shells from black walnuts were considered a waste product; because 65 percent of the nut is shell, disposal was a costly and difficult problem. However, research and market potential have since shown that walnut shells can be used in a variety of ways. Today, black walnut shell is recognized as the best of all the nut-shells and the demand has created as much of a shortage for black walnut shells as it has for the lumber and nut meats.

41. Cernilevskij, K. V. 1970. [INTRODUCTION OF JAPANESE SPECIES OF JUGLANS IN PODOLIA.] Bjul. Gl. Bot. Sada 77: 20-25. [In Russian.] Gives data on the performance of J. sieboldiana and J. cordiformis in several plantations, avenues, etc., of various ages (the oldest 63 yr) in this part of the West Ukraine. Both species are very frost-hardy, grow well, regenerate naturally, and produce valuable wood. J. cordiformis has fruit of particularly high quality and could be extensively grown in regions where J. regia suffers from frost. As regards wood production, J. nigra is superior to J. sieboldiana and J. cordiformis.


Gives notes on 80 insect species that were found to damage various parts of walnut (Juglans regia).

Most walnut (Juglans regia?) roots spread horizontally in the 30- to 85-sm-deep soil layer and occupied an area 2.8 to 5.7 times larger than the crown. A planting distance of 15 to 18 m is recommended as the root system of walnuts reaches this diameter in 10- to 15-yr-old trees.


Periods of growth and dormancy were studied in three Juglans spp. in relation to winter hardiness. Visible growth in the winter-hardy J. mandshurica and J. cinerea started earlier (end of April to beginning of May) than in the less-hardy J. regia (middle to end of May). Intensive growth in the hardier species was observed during the first part of the growing season and in the less-hardy species during the second half.

45. Chumak, I. V., and I. N. Konovalov. 1971. [ACTIVITY OF RESPIRATORY ENZYMES IN INTRODUCED SPECIES OF JUGLANS.] In Introduktsiya i ekologiya drevesnykh rastenii v Moldavii, p. 22-36. [In Russian.]

Gives data on the activity of o-diphenoloxidase and peroxidase in J. mandshurica, J. cinerea, and J. regia growing in Leningrad. In all three species, o-diphenoloxidase activity increased towards the end of the growing season, decreased after lignification of the shoots, and fell to zero during the period of winter dormancy.


Black walnut culture began in the U.S. and Europe soon after colonization. Even so, commercial production of black walnut is still restricted primarily to the U.S. and Canada, but interest abroad continues. Present cultural practices are based on many years of experience and recent intensified research. Continuing research and additional experience are needed to improve practices. Research efforts are especially lacking in protection from insects and diseases and in economics.


Numerous leaf variants of walnut are described in terms of reversion to a primitive state.


The availability of black walnut heartwood extractives from green samples that have been frozen and thawed in the laboratory decreases as the time between thawing and extraction increases. Care must be exercised to account for this variable when making extractive determinations.


Heartwood and sapwood of black walnut were prefrozen in the green condition at six temperatures from +14° to -320°F to test the effect of prefreezing on wood hygroscopicity, dimensional properties, and extractives. Prefreezing-to-drying time interval effects on board shrinkage were also measured. Induced shrinkage reductions and altered hygroscopicity were the combined effects of prefreezing on increased extractives bulking and altered rheology. The greatest effect was induced by prefreezing at -110°F; storage time intervals after prefreezing did not affect shrinkage reductions.


Research at the Forestry Sciences Laboratory has resulted in increased black walnut growth, better stem characteristics, site selection criteria, greater seed supplies, better nursery management practices, utilization of wood residues, improved hardwood machining and drying techniques, new uses for hardwoods, and increased marketing and wood-use information.

Recent studies show that although the high-quality black walnut supply is diminishing, much untapped material is still available. The trees growing on nonforest land and logging residues can supply many of our needs. That low-quality material can be utilized has been demonstrated by woods residue recovery and conversion into products. Improved drying and machining techniques can increase efficiency of high-quality dimension part production, especially from low-quality raw material. Therefore, the manufacturer who practices close utilization can use the additional black walnut sources profitably.

52. Crandall, Bowen S., G. F. Gravatt, and Margaret Milburn Ryan. 1945. Root Disease of Castanea Species and Some Coniferous and Broadleaf Nursery Stocks, Caused by Phytophthora Cinnamoni. Phytopathology 35: 162-180. Isolates from root rot of seedling Juglans nigra and J. regia killed 50 percent of 8-year-old J. nigra trees. In nursery soil known to be infected with P. cinnamoni, poorly drained sites should be avoided.

53. Crandall, Bowen S., and Carl Hartley. 1938. Phytophthora Cactorum Associated with Seedling Diseases in Forest Nurseries. Phytopathology 28: 358-360. In a North Carolina nursery, Juglans nigra seedlings infected with P. cactorum wilted and died shortly after emergence; approximately 50 percent were lost before emergence. The infections apparently had started as soon as, or before, the nuts had germinated and continued as a root rot.

54. Dahms, K.-G. 1971. [Walnut Wood—Still in Demand. I. Where Do Walnut Species Come From and How Do They Differ?] II. Uses, Procurement and Substitutes.] Holz-u. Kunststoffverarb. 6(4,8): 358-368; 568-575. [In German.]

I. Discusses the various species of Juglans, their distribution, differences, etc., and tabulates the distinguishing features of the wood of J. regia and J. nigra, and some information on the heartwood color and main growth regions of 16 species or varieties of Juglans. II. Discusses uses as solid wood and veneer, and the sources of Juglans imported into West Germany. A table is given listing 34 timbers (from Asia, America, Australia, and, mainly, Africa) that could be used as substitutes for Juglans.


34: 201-210.

In the seedlings of certain species of Juglans (notably J. nigra) the early plumular leaves possess a double leaf trace with isolated central procotyls. The traces of the first leaves are directly connected with root poles but the traces of a number of the succeeding leaves have no such connection and their procotyls do not penetrate into the root.


After two growing seasons, survival for trees from southeastern sources was higher than that for local (Kansas) trees.


Black walnut seedlings grown in a clay loam and sandy soil were subjected to two soil moisture regimes and three fertility levels. Fertilization increased growth only under moist conditions. Under drought, fertilization retarded growth in the sand. Nitrogen was the element primarily responsible for the greater growth under moist conditions.


The disadvantages of allowing natural crown development on walnut trees are discussed, and advice is given on suitable methods of crown training, the time of pruning, and wound treatment.


Bolts 2 to 8-1/2 ft long were produced from black walnut logging residue obtained from operations in southern Illinois. Over 800 graded bolts were bolt-sawed into 1-1/2-in. thick flitches, dried, surfaced to 15/16-in. thickness, and then diagrammed for determining yields of usable dimension parts. Yields averaged about 75 percent of the bolt scale (International 1/4 Inch Rule) in usable clear one-side dimension. About 70 percent of the dimension volume was in cutting lengths of 84 to 78 in.

With sections containing descriptions and discussions of the family and the two genera Carya and Juglans, each section having its own bibliography.


Walnut seedlings grown in plastic mesh tubes had deformed roots after 2 yr due to the failure of the buried portion of the tube to break down. Even though early growth and survival of the seedlings are good, future development may be questioned because of the damaged root system.


North Cent. For. Exp. Stn., St. Paul, Minn.

Problems and opportunities in grafting, budding, and rooting black walnut are reviewed with emphasis on the role of these techniques in developing and using genetically improved stock. Better application of physiological principles should lead to increased production success with currently used grafting and budding procedures. Promising new information suggests that rooting will soon be a reliable technique. Some recommendations are made for future research and the development of propagation systems.


Etiolated shoots from juvenile Juglans nigra seedlings rooted with 58 percent success (range 0 to 100 percent for 80 ortets) following pretreatment with 1 percent indolebutyric acid in lanolin. Rooting success was better in June than in April or May.

64. Funk, David T. 1971. IDENTIFICATION AND PERFORMANCE OF JUGLANS HYBRIDS. Diss. Abstr. 32(12): 6761B-6762B.

The following traits of leaf morphology were selected for distinguishing Juglans nigra, J. regia, and putative hybrids between the two species: leaflets per leaf, marginal serrations per centimeter, position of the longest leaflet pair on the leaf, leaflet length: width index, and leaf pubescence. A weighted hybrid index was calculated that separates the parent species and can be used to classify most putative hybrids.


North Cent. For. Exp. Stn., St. Paul, Minn.

Recent progress of walnut genetic research and action programs has been good. It is possible to make considerable genetic gain for growth traits simply by using walnut planting stock of appropriate geographic origin. The prospects for vegetative propagation are now considerably improved for rooting of cuttings as well as grafting.


Particulate opaline silica accounted for 0.91 to 3.79 percent of the dry weight of leaves from 30 deciduous angiosperm tree and shrub species that included Juglans nigra and J. cinerea.


Black walnut plantations on partially leveled strip-mined lands have been successfully established from seed. Dominant and codominant trees, after 32 yr, are 6.1 in. d.b.h. and 33 ft; site index, 40 to 45 ft. After the 28th yr, low thinning and singletree release more than tripled d.b.h. growth compared to unreleased trees.


North Cent. For. Exp. Stn., St. Paul, Minn.

Walnut and fine hardwoods consumer products now protected by Federal Trade Commission Guides are described. The Guides are interpreted, and the enforcement policies are explained; the consumer products still urgently in need of similar regulations are mentioned. Association activities in furniture case goods surveys and tag and label promotions are also described.
The fungus is a weak parasite, entering twigs through previous wounds. In trees that are previously weakened, the fungus makes rapid progress; otherwise the disease advances slowly. The Japanese walnut is also particularly susceptible.

The 7 yr since the Black Walnut Workshop have shown a continued decline in walnut log quality. The application of new research, tree improvement programs, and intensive culture give hope, however, that this downward curve may soon flatten. The walnut industry must also address itself to problems of marketing, economics, seedling production, and even social areas.

Observations along the prairie-forest transition zone show that the high ratio of woodland edge to woodland area creates conditions of early forest succession that are highly favorable to black walnut and other early stage intolerant tree species.

Not seen.

Apart from juglone, the bark of J. nigra contains 4-hydrojuglone, 4-glucoside, myricatin, myricitrin, sakuranetin, sakuranin, and nooakanim. These compounds appear to be absent in the sapwood and heartwood.

Sciions 30 cm long with two vegetative buds were taken from the lower part of mature 1-yr-old shoots of young Juglans regia trees and crown grafted in April on the walnut seedlings 4 to 6 m tall. The sciions were taken in either October or March but only the latter grew satisfactorily. Of five grafting methods tried, only modified rind grafts gave a high (83 percent) proportion of takes.

Heritabilities and phenotypic correlations among 18 trials of English walnut were estimated from measurements obtained over 14 yr from 38 parent and over 2,000 progeny trees. Heritabilities are above 80 for leafing date, first shedding of pollen, receptive date of pistils, harvest date, shell thickness, all nut and kernel measurements, and weight. All measures of nut and kernel size are highly correlated; they negate the practical value of measuring more than one of these traits. Selection of these traits correlated with yield appears to be an effective and economical means of achieving a reasonable rate of genetic gain in yield. Probably the key trait in this regard is fruitfulness of laterals.

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About 60 percent of commercially processed black walnut kernels are repacked for retail sale to housewives, another 30 percent is used in ice cream, 5 percent in commercial baking, and 5 percent in candy manufacture. Sterilization of nutmeats is important in ice cream manufacture. No government standards have ever been established for nutmeat sizes or quality, except for bacterial control. Recently, smaller-sized nutmeats including meal have been used for retail distribution and ice cream. The annual supply of salable kernels has been reduced 40 percent in the last decade by cutting of good nut-producing trees for lumber, by disease, and by indiscriminate herbicide spraying.

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In spraying trials, both NAA and 2,4,5-T effectively reduced the percent of new epicormics on all the trees treated, whether they were dormant or had begun new growth. Thiocarb was effective on the four species tested, especially Juglans nigra, but when applied at 0.5 and 1 percent it killed 3-year-old poplar and caused malformation and chlorosis in willows. NAA had no adverse effects, but 2,4,5-T caused some epinasty of the leaves in willows and poplars. With all compounds used, spraying dormant trees was less effective in reducing the growth of epicormics in J. nigra, olive, poplar, and willows than in Eucalyptus, Pyrus kawakami, Sequoia sempervirens, and Lagerstroemia indica. Responses to different concentrations varied with species. There was little translocation of any compound, even at the high rates used. For general use, 0.5 to 1 percent NAA, applied to runoff, is recommended.


Regrowth of trunk sprouts on eight of nine species (excluding Juglans hindsii) treated with growth regulators was reduced by 85 percent, as compared with untreated trees in these tests. The sprouts that did grow on treated trunks were only one-tenth to one-third as long as sprouts from untreated trunks. There was very little translocation of the growth regulators from the regions of application.


Relationships in black walnut heartwood between color and specific gravity, extractive content, and anatomical characteristics were explored. Percent luminance, color brightness, was significantly related to extractive content and to the combination of extractive content and some of the measures of wood density. It was found that trees from Indiana compared with those from Missouri differed significantly in the following wood characteristics: lower extractive content, higher proportion of fibrous tissue with thinner cell walls, and smaller vessel lumens.


Chemical herbicides were applied to an 8 by 8-ft area around 15-year-old 'Chesnut' black walnut trees. Branch growth and nut quantity, weight, and size were all increased by chemical weed control.


Tree growth, nut production, nut weight, and nut size were substantially increased by controlling vegetation with herbicides. The response to varying degrees of vegetation control has been consistent for the first 2 yr of the study. Because of the magnitude of response, controlling vegetation appears to be a cost of orchard management that will prove profitable over the long run.


Not seen.


CaO percent in leaves was lowest in early spring and highest at leaf fall. Highest contents occurred in Juglans nigra, Robinia pseudoacacia, and Populus tremula, and the lowest in Quercus sp. and Fagus silvatica. For mixed stands on acid soils, the highest amounts of easily decomposable litter of high Ca contents are provided by Tilia sp., Acer campestre, and Carpinus betulus.


Discusses results from fertilizing several hardwood species in the Tennessee Valley, and describes plans for a fertilization study with 17 families of black walnut as part of a tree improvement program.


Twenty-two scion-rootstock combinations of Juglans species and hybrids have been grafted, and all appear to be at least partially compatible. *J. sieboldiana* seems to be more compatible with other walnut when used as a rootstock than when used as a scion. In 5-yr-old grafts of *J. regia* x *J. nigra* on *J. nigra*, the bark tends to grow faster on the stock than on the scion.


In greenhouse studies, walnut seedlings were grown in clay pots, in a rhizosphere inoculated with Fusarium sp., Cylindrocarpon radicis, Rhizoctonia sp., and two unidentified fungi (all originally isolated from walnut roots), individually and in all combinations, to determine whether the fungi are beneficial, neutral, or pathogenic parasites of the host; three nutrient levels were also studied. After 18 weeks, plants were harvested, root samples were examined microscopically, and the dry weight and the percent and weight of N and P of whole plants were determined; the color and growth of the seedlings were also assessed. Results suggest that the reactions of host and fungus differ when only one fungus is present from those when two or more are present.


The treatments comprised: wind protection with snow fences, mulching with fresh hardwood chips, application of fertilizer, and irrigation (weekly surface application of 7.5 l/tree unless 2.5 cm of natural precipitation had fallen during the previous week). The effects of the treatments on soil moisture, amounts of K in the soil, and of K and N in leaves, leaf area, leaf water tension, and height and diameter growth in the first 2 yr are discussed. Direct planting of container-grown black walnut is recommended for farm forestry.


Walnut trees (*Juglans regia*) planted on gentle and steep (terraced) slopes facing north and south were studied in the 7th year after planting. The trees grew well on several soil types and in monoculture, but not in mixed plantings. Tree height on the southern slopes was 1.8 to 1.6 times less than on the northern slopes, and trees on the outer part of the terraces grew better than those on the inner part.


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The use of walnut trees in a concept known as multiple cropping more fully utilizes the productivity of the land. Growing forage in the interim required for trees to mature seems to offer a logical use of medium- to high-yield cropland while sustaining trees as a secondary crop. The trees will gradually change from the secondary crop to the primary crop as they grow in size.


Many landowners are interested in growing black walnut only for its nut production. Through careful control of spacing, prudent thinning, corrective pruning, and frequent but conservative clear-length pruning of the walnut trees, the nut grower should be able to produce high-value walnuts. Proper spacing and methods of pruning are discussed.


Cultivation, atrazine, and simazine were used for weed control 1, 2, and 3 yr following planting of black walnut in Iowa and Indiana. In Iowa, 2 or more years of weed control resulted in the best seedling growth, but in Indiana 3 yr proved best. Method of weed control had no significant effect on seedling growth in Iowa, but chemical control resulted in better growth than cultivation in Indiana. After 3 yr in the Iowa planting, the walnut seedlings that had received weed control for 2 or 3 yr continued growing faster than those that had received only
1 yr of weed control, even though no weed control was done in at least the last 2 yr.


A discussion of walnut seed production as influenced by dichogamy, apomixis, vegetative growth, and other factors.


The results of this investigation indicate that the members of Juglandaceae comprise a "natural" family. They also indicate that there are only four distinct genera: Carya, Platycarya, Juglans, and Engelhardtia. Pterocarya belongs with the division of Juglans of which J. cinerea may be considered the type, and Alnora belongs with the Oceomunnea section of Engelhardtia.


Cross section discs were cut at predetermined intervals from 10 black walnut trees. Growth rings on each disc were measured. Diameter, height, and volume at various ages were determined by stem analysis. Character used for early selection should have high juvenile-mature correlations. The earliest age for selection should maximize the product of the juvenile-mature correlation and the selection differential at that age.


Seasonal climatic variation, local site conditions, and tree age all interact to affect the year-to-year suitability of prospective pollinizers to be used in walnut orchards.


Black walnut, one of America's most valuable tree species, has been prized since colonial times for furniture, interior finish, and gunstocks. Its nuts have a distinctive flavor that is relished by many. The decay-resistant heartwood is chocolate brown and occasionally has darker, sometimes purplish, streaks. The sapwood is almost white. It is straight-grained, strong, hard, heavy, stiff, easily worked with tools, and stays in place well after seasoning. Because of heavy use and wasteful cutting over the years, choice black walnut trees have become scarce and the price of logs has skyrocketed.

100. Lange, A. H., and J. C. Crane. 1967.


Fifteen herbicides were applied to the roots of six deciduous fruit tree species growing in nutrient-fed sand. Of the pre-emergence herbicides evaluated in this greenhouse test, simazine, diuron, and prometryne appeared to be safest on 'Northern California' black walnuts. Based on the results obtained, the postemergence herbicides dalapon, amitrole, and paraquat have promise for use in orchard crops. Walnuts were severely stunted at the 50 ppm amitrole rate, with pronounced chlorosis in young leaves. Dicamba and pelargonic are expected to prove too hazardous for orchard use.


The character of endogenous regulators in walnut buds was followed by means of bio- assays in the course of vegetation. It was ascertained that a rise in the level of gibberellin-like substances precedes the sprouting of buds. The origination of new buds in the axil of young leaves is accompanied by a fall in the level of auxins, a low gibberellin content, and the presence of inhibitors. In this situation the primordia of staminate flowers are differentiated in the basal buds. The vegetative buds, which are formed in the axils of further leaves, stop developing because of the accumulating inhibitors. Toward the close of vegetation the primordia of pistillate flowers originate in terminal buds and their differentiation is accompanied by a substantial rise in the level of main-like substances, while some of the inhibitors keep ascertaining themselves. On the basis of these findings, we have tested the possibility of affecting the differentiation of staminate primordia and of vegetative buds by the exogenous application of selected regulators. Spraying young leaves with IAA and MH solutions
will increase the number of vegetative buds in the twigs. A later spray of other twigs by TIBA and GA_4 solutions will increase the number of stamineate buds.


In the walnut forests of southern Kirgizia, soil-moisture reserves increased in autumn through spring and decreased gradually in summer. The maximal and minimal moisture reserves under forest were greater than in the old cultivated soils that interrupt the continuity of the forest.

103. Lebedinova, N. S. 1968. [MOISTURE REGIME OF DARK BROWN SOILS UNDER A CANOPY OF DIFFERENT TYPES OF WALNUT FORESTS IN FERGAN.] Pochvovedenie 12: 32-41. [In Russian with English summary.]

In the walnut forests of south Kirgizia, evaporation exceeds precipitation and in the dry, second half of the vegetative period the trees depend entirely on soil-moisture reserves. This dependence is particularly great for Fergan walnut because of its long vegetative period. In this mountainous region, Fergan walnut receiving only natural moisture grows best where soil moisture derived from precipitation is supplemented by perched water tables or artesian water. Where soil-moisture reserves are insufficient, irrigation is necessary for good growth.


Universal demand and high value commonly associated with the sale of walnut timber may result in an excessive tax burden to farmers/woodland owners. It is the purpose of this report to present the proper treatment of incurred costs and the use, benefits, and regulations of long-term capital gains and losses as related to the small, individual timber owner.


A soil modification method tested in southern Illinois to determine whether internal drainage of floodplain soils could be improved to promote better black walnut seedling growth provides no practical evidence of growth acceleration after four seasons.


Site requirements of 38-year-old plantation-grown black walnut on floodplains in southern Illinois were studied. Depth to a gravel layer was the only soil factor that significantly influenced height growth. There was a relationship between internal soil drainage and height growth.


The relationship between observable soil characteristics and black walnut growth is discussed, and a procedure is presented for using soil and topographic factors to select and evaluate areas for growing black walnut. Also, the influence of soil characteristics on the need for and extent of various cultural practices is examined.


The soil series occurring in Illinois are classified as to their suitability for growing black walnut. Three categories—suitable, questionable suitability, and unsuitable—are used to assist Illinois Division of Forestry district foresters in selecting the better sites available for this valuable hardwood.


After unusually heavy rainstorms in the spring and fall of 1970, over 2,600 tons of silt were deposited over 4.8 acres in a black walnut plantation in north-central Missouri. This silt deposit caused extensive mortality and growth reduction in the
plantation. Walnut mortality and diameter-growth reduction were closely related to thickness of the silt deposit. Deposition of silt in the spring was more detrimental to walnut growth than siltation in the fall just preceding the winter dormant season. This episode demonstrates the need for erosion-control practices and for more critical site evaluation when selecting a planting area for this valuable hardwood species.


Ten deciduous species of tree seedlings were completely submerged during June and July. Two weeks’ submergence caused little damage, but black walnut was intolerant of 4 weeks under water, being the only species to suffer complete mortality.


Describes techniques suitable for grafting black walnut before and after growth of the rootstock has started.


F1 hybrids between Juglans regia and J. nigra tend to be sterile and produce very few nuts. F2 hybrids tend to grow vigorously and are slow to bear. Although no seedling worthy of propagation as a nut variety has been found among 125 F2 hybrids that have fruited, there appears to be sufficient variability to justify fruiting the remaining 378 seedlings.


Raising from seed and propagation by budding and grafting for Juglans spp. is described with particular reference to work at Eastalling Research Station.


Over 87 percent of the roots were located in the 40 to 220 cm layer of soil (80 percent at 40 to 60 cm) and about 12 percent at a depth of 20 to 40 cm.


Splice grafting green components in late May or early June was unsatisfactory, averaging over 3 yr only 15.8 percent take. Patch budding in June or July had 47.6 percent success, but patch budding with dormant buds in August showed less than 20 percent take.


14C-Ethephon applied to a walnut leaflet penetrated and was translocated rapidly in young plants, but more slowly in older plants. The compound was translocated to the kernel at higher levels when applied to a leaflet than when applied to the hull, but in both cases the levels of activity were low. Between 5 and 7 days after application the radioactivity in the kernel decreased markedly. 14C-Ethephon in the leaves, hull, shell, and kernel was metabolized, but no side products remained in the plant tissue that could be detected by the techniques employed.


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Everyone who owns or plans on owning a walnut tree is interested in the value of that tree. Value is generally measured by tree or log grades. The number, type, and location of defects are common to all grading systems. Defects generally fall into two categories: (1) those that are natural or caused by some external force upon the tree, and (2) those that are created by man in his manufacturing or processing of the tree. Understanding defects and their importance to the manufacturing of the final product will help the timber landowner better understand the value of his resource and will guide him toward using the proper forest management practices.

118. Maurer, K. J. 1971. [SUN SCORCH DAMAGE IN WALNUTS AFTER THINNING OUT OLD CROWNS.] Erwerbsobstbau 13: 13-14, illus. [In German.]

Illustrations show bark damage by sun scorch and the occasional invasion of the
wounds by Schizophyllum commune. Recommended measures to prevent damage comprise thinning out the crows over several years, pruning and training grafted trees to form small open crows, and cleaning the wounds and treating with a wound-healing preparation.


Inoculating irrigated meadow-bog serozem with soil from a forest of Persian walnut increased formation of endotrophic mycorrhizae in the seedlings and also increased their growth.


Not seen.


The more important insects affecting wood and nut production are named and briefly discussed. Wood crop insects mar tree form or impair increment growth by retarding or spoiling it. Walnut production practices may at times intentionally increase insect numbers. Nonchemical control or regulation measures are highlighted. New information about insects is not keeping pace with progress in other aspects of walnut production technology.


Selected varieties of Juglans species can be propagated by bench grafting in the fall followed by a 5- to 4-week callusing period at 26°C in moist, sterilized sand. The grafts are then stored at 0°C until the completion of the dormancy period when they can be planted. Sidewood must be mature and the relative humidity in storage sufficiently high to prevent dessication.


During 4-yr studies the oil content in 44 walnut forms and the protein, P, and K contents in 15 of them, were determined and are tabulated.


Not seen.


Seasonal variations of total and reducing sugar are tabulated for stems and leaves of Viscum album L. and those of its host plant, Juglans nigra L. Differences in reducing sugar in parasite and host plant, on one hand, and in parasite and in control plant on the other were more pronounced than the variations in the total sugar. A comparison of the sugar content in mistletoe parasitizing different hosts revealed that the nature of the host had an evident influence upon the carbohydrate content of the parasite.


The decision to cut a walnut tree should be carefully weighed in terms of its present value as opposed to its future value. Maximum economic yield is possible when each tree is evaluated as an individual in terms of its own quality, size, and growth rate. Instructions are given for the use of a graph to find the compound earning rate and examples show the effects of pruning and release.


In trials carried out in 1964 and 1966, it was shown that success in spring budding of walnuts depended chiefly on the temperature and on the development of the rootstocks. The air temperature should be above 10 to 14°C, and the rootstocks should
be growing and with bark easily separable from the wood. The greatest degree of success was obtained using bud-stocks that had been selected earlier in the year and stored. Shortening the rootstock had no effect on bud take, but favorably affected the growth of the scion shoots.


In 17-yr-old grafted trees of two walnut varieties, secondary flowering was observed and both male and female flowers occurred in the same inflorescences. This is a vari-etal characteristic occurring mainly where the male flower buds are killed by frost.


The raw protein contents in the kernels of three walnut cultivars are given. Of the essential amino acids, lysine, threonine, and methionine + valine occurred in the highest concentrations.


Amount of total heartwood extractions varied substantially between trees of J. nigra; this variation was not related to rate of radial growth. Amounts of total, and total phenolic, heartwood extractions exhibited marked variation radially within trees; this variation was strongly and posi-tively related to the number of rings from pith. Relative volume of parenchyma varied substantially between and within trees. Between-tree differences were related to rate of radial growth in only a few cases. Relative volume of parenchyma was not related to between-tree variation in amounts of total extractions. By eliminating amount of parenchyma as a control mechanism, the results pointed to metabolic control of rate and duration of aromatic biosynthesis within each parenchyma cell as being the primary determinant of amount of phenolic extrac-tives produced. Geneticists should not attempt to control the amount of heartwood extractions in hardwood species by selecting for high or low relative volumes of parenchy-ma.


Marked polymorphism was observed in the nuts of an artificial population of J. regia from different plantings. A relationship was found between the age of the plantings and nut and kernel weight and shell thickness, which decreased with increasing plantation age. Correlation cor-rellations were established between kernel percentage and nut weight, kernel percentage and shell thickness, and kernel weight and internal seedling weight. The greatest variability within a tree was found in nut and kernel weights, and the smallest in the length of the nut.


Discusses weed control in young black walnut plantations.


A monograph on the natural J. regia forests of Kirghizia, describing: environmental conditions, past history and present status, biological and ecological characteristics of J. regia. Forest types, organi-zation of seed production, plantations,
falling in plantations and natural forests, etc. The monograph is a revised and enlarged version of a book already noticed.


Investigations of lethal substances other than juglone in the walnut 'Onigurumi,' led to the isolation and identification for the first time, of 2,3-dihydroxy-1,4-naphthaquinones (naphthazarin) in plants. Naphthazarin had a complicated dualistic effect acting both as an uncoupler and an energy transfer inhibitor, while juglone was only an energy transfer inhibitor.


The forthcoming yield of 48 (Juglans regia?) trees of different ages was successfully calculated in two successive years from the percentages of terminal and lateral buds producing pistillate flowers and the available numbers of pistillate flowers per terminal and lateral bud.


The selection of 20 walnut types from 353 promising trees is described, and data on the form and growth of the trees, yield potential, flowering habit (protrandrous, etc.), and fruit characteristics are tabulated.


The structure of the fruit (Juglans regia?) is described and illustrated.


A review with 288 references. Soil moisture effects are briefly covered. Juglans and Platanus spp. are included.


In a black walnut provenance-study plantation in Quebec, spring frost damage during the first 2 yr was strongly correlated with latitude of seed origin. No trees originating in Canada were damaged; frost injury to trees from U.S. collections ranged from 3 percent (Vermont) to 87 percent (Tennesee).

Field test of four provenances of black walnut was established during the years 1882-1884 at Pointe Platon, near Quebec, Canada. Following severe mortality at the seedling stage due to frost damage, the residual plantation, which was established on three river terraces, subsequently formed several well-defined populations as a result of genotype-environment interaction. These populations showed strong variation in degree of frost resistance. The best stems exhibit an increment and quality comparable with that for the species in the central United States.


Properties of open- and forest-grown black walnut from six States were related to growing conditions. Open-grown trees had heavier, harder wood and less variable moisture content than forest-grown trees. There were no differences in straightness of grain.


In trials with 30 forms of 5- to 3-yr-old trees of Juglans regia propagated from seed, variations were observed in type and time of flowering and of bearing, yields, type of fruit ripening, initiation and termination of seasonal growth, pest and disease resistance, winter hardiness, morphological characteristics of the tree, and commercial quality of the nuts.


Ten trees obtained from seedlings of different walnut varieties and capable of flowering and fruiting twice a year were studied for 8 years. The trees that started bearing in the third year flowered normally in late April and early May and again in late May and early June. The second inflorescences (5 to 80 cm long), produced on short green shoots of the current year's growth, consisted of staminate, pistillate, stamineate and pistillate, or hermaphroditic flowers. The fruits from the second flowering ripened almost simultaneously with those from the first but were slightly smaller. Each type of inflorescence is described and the economic possibilities of a wider distribution of this type of walnut tree are discussed.


Seasonal variations in 'catalase quality' (number of active molecules per gram-molecule of the enzyme) were determined in the leaves and bark of 2-yr seedlings of J. mandshurica and J. regia grown at Vladivostok and the more severe climate of Strelnovsk. The results (shown in graphs) confirm that variations in catalase quality can serve as an indication of winter hardiness.


Not seen.


Includes results from a pot experiment with black walnut using forest and old-field soils collected in Iowa and Missouri. The walnut seedlings grew significantly better on the forest soils than on the old-field soils. Seedling growth on all of the soils, however, was improved by addition of fertilizers. Results of chemical analyses for 12 elements in the leaves of the walnut seedlings are also included in the report.


A general review of some of the basic cultural practices in managing immature black walnut trees is presented. It is proposed that potential crop trees be selected as early in the rotation as possible and cultivated on an individual tree basis. Early release and thinning are also recommended for maintaining rapid growth. Study results show that pole-sized and small sawtimber-sized walnut trees also grow faster if released and thinned, but older sawtimber-sized trees show little or no response. Tentative stocking and spacing levels for
maintaining good growth and good nut production are presented. Corrective pruning and clear-stem pruning are necessary at appropriate times during the rotation to produce straight stems and high-quality wood. Research in progress indicates that fertilization also may be feasible for maintaining good growth.


The presence or absence of nutrient deficiency symptoms can serve as a quick guide to the nutrient status of black walnut plantations or orchards. Deficiency symptoms for several essential nutrients are described and illustrated with color plates. Laboratory analyses should be made to verify suspected nutrient deficiencies. Tentative critical foliage nutrient levels are presented to aid in evaluating results of the laboratory analysis. Suggested procedures for collecting and processing leaf samples are also given.


Complete crown release more than doubled the diameter growth of pole-size black walnut trees in southern Indiana over a 10-yr period. Partially released trees grew about 50 percent more than unreleased trees. Most of the trees produced burl sprouts; however, the incidence of sprouting was higher and the sprouts were larger on the completely released trees than on the unreleased trees. Controlling understory growth had no significant effect on growth of the walnut trees.


In Poland, scions of black or English walnuts are collected in early October, bench-grafted on dormant seedlings, and packed in a box maintained at 78 to 80°F for 3 weeks. Grafted plants can then be field-planted or put into cold storage until spring. Up to 90 percent success is claimed for the method.


Find (crown) grafts were made on decapitated stems in 20-yr plantations in Kirghizia. Details of the technique and of subsequent graft survival are given. Although the grafting was done with great care, survival after 4 yr was <40 percent, and it is concluded that this method is unsuitable for large-scale improvement of nonnurseries plantations or natural forests of J. regia. Instead, such stands should be improved by removing inferior and unhealthy trees.


Data are given showing the harmful effect of the disease (pathogen Gnomonia [leptostyla], conidial stage Massonina juglandis) on shoot growth and fruit weight. Some intergeneric hybrids of J. regia with J. nigra, J. cinerea, and J. sieboldiana have proved to be immune, as have forms of J. regia introduced into Kirghizia from other regions of the U.S.S.R.


The growth in length and width of the fruit of Sorrento walnuts (J. regia) followed a double sigmoid curve; it was very rapid at first, slowed down for several weeks (phase II), increased again, and finally leveled off. In both years of the study, the start of phase II corresponded with the onset of hardening of the endocarp, which took about 25 days. Changes in the water, N, P, K, and Ca contents of the fruit during its growth are described.


Not seen.


A summary review, with 15 references, of nutrient and fertilizer requirements of apple, citrus, and nuts.

Black walnut is commonly associated with Cornus florida, Quercus alba, and Robinia pseudoacacia.


On all loam soils in southern Illinois, the best combination of seed control without injury to black walnut seedlings was provided by 6 lb simazine 80W plus 1/2 pt parquat per acre applied before planting.


Results from studying seven characters in black walnut trees originating in various geographic areas and planted at several locations are summarized. No geographic area produced unusually large or small black walnut seed. Trees originating in southern areas tend to flush earlier in the spring, hold their leaves longer in the fall, grow larger, and produce more lateral buds on the current year’s terminal than trees originating in northern areas.


The 10 black walnut plantings ranging in age from 19 to 56 yr, and the 60-yr-old natural stand for which data are presented in this report, show generally slow growth. These growth data also show that planting black walnut in mixtures with other species, or bordering walnut plantations with coniferous plantings, has little beneficial effect without additional cultural treatments.


Immature walnut (Juglans regia) fruits sampled on 20 June contained 2,186 to 3,069 mg percent ascorbic acid, the kernels at harvest on 5 September contained 13 to 48 mg percent and after 4 months' storage 4.2 to 6 mg percent. The kernels also contained 1 to 1.5 mg percent tocopherol; rutin was found in milky-ripe but not fully ripe fruits. The Fe2O3 content of the kernels ranged from 0.16 to 0.03 mg percent and MgO from 0.22 to 0.52 mg percent.


Experimentally inflicted wounds of Persian walnuts (Juglans regia Hartley) are susceptible to infection by Erwiniarubrifaciens. Trees were not susceptible during the winter (January), but were highly susceptible in spring (April), summer (July), and fall (October). Wounds decreased in susceptibility with time at the average rate of 10 to 12 percent/day. Seven days after wounding, fewer than 3 percent of wounds remained susceptible in April and October, and about 15 percent in July.


Describes the distribution in California, symptoms, spread, temperature requirements, etc., of this disease of cultivars of Juglans regia caused by Erwinia rubrifaciens. Attacks are largely confined to the Hartley cultivars. Natural infection has not been found in J. hindsi or J. californica. Control measures are described.


A requisite for development of bacterial phloem canker is the presence of the highly susceptible Hartley cultivar. The age of the plant part is important in the disease, which occurs only on trunks and primary (scaffold) branches. Extension of the cankers was most rapid during the summer when the temperature was high. Breaks in the...
thick phellem of the trunks and branches are necessary for penetration of the pathogen to the inner bark. Of the several types of breaks commonly occurring, those produced by mechanical harvesting equipment and by sap-sucking birds were found to be infection sites.


Yield of dimension from top grades of walnut lumber can be predicted by charts. Various grades can be compared to determine the most economical mix for a specific cutting order.


The significance of recent dimension stock yield studies using hard maple, black walnut, and red alder, is discussed in light of its interest to manufacturers, consumers, and scientists. The data are useful in determining the most economical lumber grade(s) for specific requirements, facilitating more complete utilization of the resource by demonstrating maximum obtainable yield, and encouraging the use of the lower grades that are in greatest supply. The application of the data by use of a nomograph is illustrated, and the acceptance of the data and its relationship to associated research is summarized.


Machining properties of black walnut were satisfactory regardless of locality, site, growth rate, and anatomical characteristics. Specific gravity influenced the machining and mechanical properties more than any other feature. Indiana-grown black walnut heartwood contained less extractive material and consequently shrank more than Missouri-grown wood. Good sites, regardless of location, produced tougher wood than poor sites.

Not seen.


Triple supper placed in trenches 6 in. deep and 3 ft from the trunks of young trees and 6 ft from the trunks of mature trees significantly increased yields. Broadcasting fertilizer was not effective.


The intent of the Illinois Timber Buyers Licensing Act is to protect the landowner's right to receive money due for timber sold, and to protect against timber piracy. The Act requires anyone buying timber from the timber owner to be licensed. To obtain a license a surety bond must be posted. Amount of bonding surety is based on total timber purchases. Anyone transporting two or more logs or Christmas trees on any road in Illinois may be required to show proof of ownership under provisions of the Forest Products Transportation Act.

Not seen.

Not seen.


Softwood cuttings from adventitious shoots and current-year seedlings of black walnuts were rooted under intermittent mist when treated with IBA in 95 percent ethanol. Rooting percentages of 80 to 100 were attained from shoots of adventitious origin with 1-, 2-, and 4-yr-old seedlings, and lower limbs of a 15-yr-old tree. Rooting percentages of cuttings made from current-year seedlings were similarly high. Seventy-three percent of rooted cuttings transplanted from the mist bed to containers in the greenhouse initiated shoot growth within 2 to 6 weeks after being transplanted.

Softwood cuttings from shoots originating from adventitious buds of black walnut were successfully rooted under intermittent mist when selected at the right stage of development and treated with 5,000, 8,000, or 10,000 p/m IBA in 95 percent ethanol. Rooting percents of 80 to 100 were attained using cuttings taken from shoots of adventitious origin from 1-, 3-, and 4-year-old seedlings, a 153-year-old stump, and lower limbs of a 12-year-old tree. Rooting percents of cuttings made from terminals of current-year seedlings were similarly high. Seventy-three percent of rooted cuttings transplanted from the mist bed to containers in the greenhouse survived and initiated new growth.


The original carpellary cavities are narrow slits with smooth walls. The carpellary tissue gives rise to a continuous endocarp, a more or less incontinuous mesocarp, and parenchymatous endocarp. The exocarp develops into the hard outer shell of the nut.

187. Shvidenko, A.I. 1970. [INJURIES CAUSED TO WALNUT TREES BY FROSTS IN BUKOVINA.] Lesovedenie I: 89-90. [In Russian.] Not seen.

188. Shvidenko, A.I. 1971. [GROWTH OF JUGLANS REGIA WITH OAK ON DRY OAK FOREST SITES.] Lesn. Khoz. 10: 10-12. [In Russian.]

Describes studies in mixed walnut/oak plantations in the forest-steppe region of the West Ukraine. The walnut, which has been deliberately favored by various silvicultural measures, has a greater height and diameter than oak at age 10 yr, but the oak eventually suppresses it, and these species should be regarded as incompatible for mixed plantations.


Further bioassay of auxins and gibberellin-like substances were made on developing buds, young fruits, and mature leaves of a tree aged 40 yr, after separation by paper chromatography. Complex patterns of different growth regulators and inhibitors were revealed, and their significance is discussed. The development of bud primordia in the second year after spraying the young leaves with active substances showed that: IAA or MH (maleic hydrazide) made male flowers revert to vegetative buds that developed abnormal leaves resembling those of the more primitive family Fagaceae; tritiodobenzoic acid transformed vegetative buds in the male catkins; male catkins formed some female flowers after higher doses of IAA; and female flowers were not affected by treatment (previously owing to high concentrations of endogenous substances), but fruit development was distorted.


Of 2,500 walnut (Juglans regia) trees studied in 1968-1969, 40 were only slightly damaged at -30°C, and 15 of these that showed good commercial qualities were selected.


Both fox and gray squirrels prefer shelled black walnut kernels over shagbark hickory or any of four species of oak kernels. Approximately 15 min was required to open and eat a fresh whole walnut. Coevolution of squirrels and most species is discussed.


A proposed commercial kiln schedule, faster and hotter than previously published schedules, is limited by prohibitive degrade as higher temperatures are reached. A top temperature of 185°F is recommended.


An analysis was made of costs and returns from two hypothetical black walnut plantations of different spacings in which fescue was grown for seed between the rows of trees.
and nuts were sold. Because seed and nuts contributed a substantial share to total revenue. After allowance for all costs including income taxes, the internal rates of return were 8.3 and 12.9 percent respectively for the 18- and 40- by 40-ft spacings. Benefit-cost ratios were 1:35 and 1.87, based on a 6 percent discount rate. With the cost of land and initial costs of establishment assumed, $16,000 to $16,000 would be required to start a 40-acre plantation.


Summarises trends in number of leaf samples sent in by walnut (probably Juglans regia) and filbert growers in Oregon that show deficiencies of nitrogen, potassium, and boron. Deficiency levels for each of these mineral nutrients are also given for both tree species. The levels of nitrogen in samples sent in by growers in recent years have been declining, probably because more ammonium-type fertilizers are being used and there is less nitrification with acidification of the soils.


Increased nodal complexity in the Juglandaceae is associated with at least two independent evolutionary shifts from epigal to hypogal germination. Presumably the complex development of the cotyledonary node is a response to increased functional demands of hypogeous outedone.


The great diversity of Juglans regia types found in these regions is of interest for both commercial use and breeding.


Not seen.


Not seen.


Hammermilled bark from seven hardwood species was studied as a possible alternate for peat moss in the production of potted chrysanthemum plants. In general, plants grown in bark-amended mixes were less succulent (more "woody") and had fewer flowers. The pH of bark-amended soils was higher than peat-amended soils, often above pH 7.0 and approaching undesirable levels for optimum nutrient uptake. Walnut, maple, and sycamore bark yielded more satisfactory plants than oak or ash bark.


Moisture regime was studied under pure stands, 25 yr old, density 1.0, height 8 to 11 m, of peltate oak, Siberian larch, Amur cork tree, and Manchurian walnut. Mean rainfall was 380 to 650 mm, soil clay content 20 to 30 percent, porosity 48 percent. Penetration of moisture was greatest under cork and walnut; most of the moisture coming from thawed snow. The lowest moisture supply was found under larch; the highest under walnut and cork. Under walnut and cork a soil layer with high moisture content (10 to 20 percent) was found at 2 to 4 m depth.


Juglone was detected in all the green parts of a J. regia tree; i.e., in the inflorescence, stem cortex, leaves, and fruit husk. The total content of juglone in the husk generally increased between 9 May and 30 September although on dry and fresh weight bases the content decreased; the amount present depended on the size of the fruit and not on the date. Shading the fruit with black paper and deflecting the fruiting branch slightly delayed fruit growth but completely prevented the accumulation of juglone in the husk. This finding and the fact that leaves of fruiting branches were the richest in juglone support the idea that the juglone of the fruit is elaborated partly in the husk and partly in the adjacent leaves, and that the synthetic process is light dependent.

Walnut seedling rootstock with a stem diameter of 1.0 to 1.5 cm were lifted in late autumn and heeled in. Scion cuttings were taken from the mother tree shortly before grafting. The rootstock and scions were kept in moist sawdust at 26 to 28°C for 10 to 15 and 2 to 3 days, respectively. After bench grafting at monthly intervals from December to April, the grafts were stratified in fungicide-treated moist sawdust in boxes at 26 to 28°C. Callusing occurred in 10 to 15 days. Maximum and minimum callusing occurred in plants grafted in December and in March to April, respectively. The callused material stored satisfactorily at 0 to +2°C until planting in early May. Outplanting and aftercare are described.


Trees from 14 locations in 4 different climatic regions in Yugoslavia were established in 2 nurseries. The largest trees originated in the Banjšica region. The proportion of monoaxial plants varied in accordance with the geographical latitude and height above sea level.


Symptoms of trees with Zn deficiency were: (1) ZnSO₄ applied in 1966, (2) ZnSO₄ + hydrated lime applied once 1966 and once in 1968, (3) ZnSO₄ + hydrated lime: once in 1966 and twice in 1968, and (4) ZnEDDS four times in 1966 and twice in 1968. Deficiency correction was best with (4) and nearly as good with (3).


Portions of this article describe a 24-yr study to determine the effect of five moisture regimes on the growth of Concord walnuts with northern black walnut rootstock. Moisture regimes ranged from no irrigation (soil allowed to dry out) to frequent irrigation (soil at or above field capacity). There was no significant treatment response on yield of walnuts, growth and size of walnuts, or growth of the trees. Lack of treatment response was attributed to large amounts of soil moisture in the upper 6 ft of soil that was not depleted before most of the annual growth had been completed.

207. Vernik, R. S. 1961. [ECOLOGICAL CONDITIONS OF GROWTH OF WALNUT-FRUIT-TREE FORESTS IN THE BOSTANLYK REGION OF UZBEKISTAN.]

Bot. Zh. 45: 1766-1773. [In Russian.]

Even on southern slopes of the Ugam mountain range the soil-moisture content at the driest time of the year was greater than the wilting coefficient of walnut on brown forest soil when the soil was deep. On southern slopes that were bare or were eroded and planted with alder, soil moisture was insufficient.

208. Vernik, R. S. 1970. [EXPENDITURE OF WATER IN TRANSPIRATION BY WALNUT FOREST IN THE UPPER REACHES OF THE CHTCHIK VALLEY.]

Lesovedenie 5: 21-26. [In Russian with English summary.]

Tabulates details of the transpiration of Juglans regia, Prunus [sugdiana], Crataegus [tuerkestanica], and the herb layer in seven different walnut forest types in the West Tien Shan Mountains. Water expenditure in transpiration is compared with mensurational data for the stands, and conclusions are drawn on the optimum stand composition and constitution as regards forest productivity.


In The fruiting of Juglanis regia, Picea schrenkiiana, and Juniperus spp. in the Tien-Shan. Izdatel'stvo Il'm. P. Frunze, 137 p. [In Russian.]

Not seen.


Lesn. Khoz. 10: 83-85. [In Russian.] 

Not seen.


Kernels oil content and fatty acid composition of the oil, including the ratios of linoleic:linolenic acids, were studied in five Bulgarian varieties.

The biological cycle of the pathogenic agent was studied and it was found that the transmission of the disease from year to year is performed only through the intermediary of the perfect form and that many conidia producing secondary infections develop on the organs attacked, during the vegetation period. As a function of the fungus biology, the walnut phenology and the climatic conditions, three to six treatments are required, in most years the first treatment being applied during April or May. When the combination of extractive content and the climatic conditions is such, the disease is just a considerable fungicidal treatment that can be effective to block the first primary infections. Most effective were the copper-based products and the organically synthesized ones.


Ecological conditions and development of black walnut in four plantations in Yugoslavia are described. A 54-yr-old plantation on dances of deep sandy loam averages 20.5 m tall. On very deep Chernozem soils, three plantations 32 to 35 yr old range from 19.8 to 22.0 m tall.


Relationships in black walnut wood color, specific gravity, extractive content, anatomical characteristics, machining, and mechanical properties were explored. The influence of geographic location, site quality, and growth conditions on these properties was also examined. Luminance was related to extractive content and to the combination of extractive content and some measures of wood density. Indiana trees differed significantly from Missouri trees by having: higher luminance value, lower extractive content, greater shrinkage, higher proportion of fibrous tissue with thinner cell walls, and smaller vessel lumens. No differences were detected in the physical characteristics or properties between trees from the two States.


Profit was the motive when 80 acres of black walnuts were planted 11 yr ago. Since then I have learned a great deal about walnuts and as yet have received no profit; however, I harvested 8,600 pounds of fine-quality nuts last year. I expect to start making a small profit in the next 2 or 3 yr. Using bluegrass as a second crop in the orchard has brought a reasonable return on the land while the trees grow into bearing and will play a great part in the future profits from this operation.


Black walnut and tulip poplar seedlings were evaluated for their tolerance to simazine, atrazine, and diuron. One- and 2-yr-old nursery-grown seedlings as well as newly germinated seedlings grown in a sand or sand-vermiculite medium were treated with the herbicides in a greenhouse environment. Two-yr-old tulip poplar was tolerant to simazine at 0.26 p/m, but showed little or no tolerance to higher concentrations. Little tolerance was observed for tulip poplar to atrazine and diuron. In contrast, 1-yr-old black walnut was tolerant to 0.50, 0.50, and 1.00 p/m levels of simazine and to 0.25 p/m of atrazine and diuron. The response of newly germinated tulip poplar to simazine closely paralleled barley, a simazine-sensitive species; whereas the response of black walnut paralleled that of corn, a simazine-tolerant species. Chromatograms of foliar extracts indicated that black walnut was able to degrade simazine to at least four unidentified metabolites.


The experiments reported showed that autumn-sown Juglans nigra seed produced more and larger seedlings than spring-sown at most Central States nurseries. Removing the husks of the nuts did not affect seedling yield, but reduced the volume of seed
by about two-thirds, making the seed easier to store and stratify.


In test plantings with black walnut in Illinois and Indiana, fibrous rooted seedlings did not survive better or grow faster than single taprooted seedlings. Stem diameter appears a better indicator of early height growth than root fibrosity.


Several tests were made to develop effective storage methods for black walnut seed using seed collected in southern Indiana in 1965, 1967, and 1968. Major variables included storage facility, seed moisture content, storage temperature, and length of time in storage. The seed retained its viability better in outside pits than in cold rooms. With pit storage, seed viability could be maintained up to 2 yr in storage with little loss in germination. Seed moisture content was not as critical for pit storage as for coldroom storage. For storage at 37° F the best seed moisture content was 40 percent; at 19° F it was between 30 and 30 percent; and at -15° F it had to be reduced below 20 percent to maintain germination.


Following exposure to 16° F temperature in early November 1971 in a southern Indiana nursery, many walnut seedlings were top-killed. Trees of Kentucky, Tennessee, and Alabama origin suffered about four times as much damage as those from Michigan. Seedlings fertilized with ammonium-type fertilizers were less severely affected than unfertilized seedlings or those treated with sodium nitrate. More than 60 percent of the injured seedlings died during the first growing season after outplanting.


A survey of 25 States growing black walnut planting stock shows that the demand for black walnut seed and seedlings increased throughout the 1960's. Seedlings shipped from the nurseries increased from about 789,000 in 1963 to more than 2.7 million in 1971. Annual shipments of seed and seedlings fluctuated greatly, primarily because of irregular seed supplies, root rot, and poor seed germination. Research related to these problems and to fertilization and weed control in black walnut seedbeds is discussed.


The disease is characterized by extensive, shallow, irregularly shaped cankers in the bark of the trunk and scaffold branches of mature trees. Cankers expand throughout the summer but are inactive in winter.

223. Wright, Ernest, and H. R. Wells. 1948. TESTS ON THE ADAPTABILITY OF TREES AND SHRUBS TO SHELTERBELT PLANTING ON CERTAIN PHYMATOTRICHUM ROOT ROT INFESTED SOILS OF OKLAHOMA AND TEXAS. J. For. 46: 256-262, illus.

Juglans nigra is of intermediate susceptibility and is tentatively recommended for shelterbelts on sandy sites.
Dillow, Martha K.
North Cent. For. Exp. Stn., St. Paul, Minn.

A supplement to Research Paper NC-9 published
in 1966, and Research Paper NC-70 published in
1971, this list covers 223 additional references
dealing with the growth and production of walnut.

OXFORD: 0(048.1):176.1(Juglans nigra).

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Nature is beautiful...leave only your footprints.