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SEVERAL SPECIES OF NUT-PRODUCING TREES are native to parts or all of Illinois; other species have been imported into the state. Possibilities of profitable commercial production of nuts in Illinois are limited, but growing nuts for home use can be an interesting hobby, providing nourishing and delicious food and enhancing the landscape.

This circular is prepared for the homeowner rather than the commercial producer. The suggested cultural practices are designed to be within the scope of the interested homeowner.

NUT SPECIES

Black walnut

This native species is the most dependable nut plant for Illinois. Several varieties, which have superior nuts, more disease resistance, and more dependable production than other varieties of black walnuts, are listed in the suggested variety list. Walnuts prefer deep, fertile, moist soils such as are found in river bottoms, but they will grow in a wide range of soils. Avoid excessively wet soils.

The spicy flavor and aroma of black walnuts make them especially adapted for use in cooking and baking.

Hickory

All of the hickory species are tall, handsome trees. Shagbark and shellbark species and shagbark-shellbark hybrids are preferred for nut production. Several varieties with improved nut quality have been developed. Bitternut, pignut, and mockernut hickories produce nuts of inferior quality, but the fall coloring of their leaves is more spectacular than that of the species with better nut quality.

These species of hickories are all native to Illinois. Shagbarks are best adapted to upland soils; shellbarks grow best in alluvial or floodplain soils.

Pecan

Pecans are related to the hickories and, like the hickories, develop into large, attractively shaped trees.

So-called hardy northern pecans are native to the bottom lands in southern Illinois along the Wabash, Ohio, and Mississippi Rivers. The southern or paper-shell types require a longer frost-free growing season for good nut filling than is usual in even the most southerly part of Illinois. Proper filling of hardy northern pecans also requires a certain period of frost-free weather, the amount of which determines the northern limits of nut production. These trees bear more regularly in area 1 (see Fig. 1). They are less dependable in area 2, and only occasional production can be obtained in some parts of area 3.

Pecans produce best in fertile river bottom soils, but some production can be obtained from trees planted on fertile upland soils.

NUT GROWING IN ILLINOIS



Figure 1. Growing zones for northern hardy pecans.

Chestnut

Chinese chestnut trees are attractive, medium-size trees with a spreading, rounded form. They do well in most locations in Illinois but may fail on heavy, poorly drained soils. Most important, they have a fairly high resistance to chestnut blight disease — a disease that has almost eliminated the American chestnut from its native habitat.

Chinese chestnut trees are available from nurseries as young trees produced from seed (seedling trees) and as grafted named varieties. The seedling trees may vary somewhat in tree and nut characteristics and may not be as productive as grafted trees, but grafted trees may suffer from graft-incompatibility problems and be short-lived.

Chinese chestnuts are self-unfruitful. There is enough variation in seedling trees, however, to provide cross-pollination if two or more trees are planted. For cross-pollination of grafted trees, at least two different varieties should be planted.

Hican

These are hybrids resulting from a hickory-pecan cross. As would be expected, the characteristics of the tree and nut are a blend of the char-

acteristics of the parents. They are an interesting novelty but most are not heavy bearers.

Persian walnut (hardy English or Carpathian walnut)

The major varieties of Persian walnuts grown in California require too many heat units or too long a frost-free growing season for production in Illinois. Some shorter-season varieties can be grown in Illinois, but blossom kill from late spring frosts is a constant threat to production in all areas of the state.

Walnut blight, a bacterial disease, is serious on susceptible varieties. Use grafted trees of the more resistant varieties (see suggested variety list). Persian walnuts are medium-size trees.

✓Filbert (hazelnut)

Filberts are not trees but multistemmed large shrubs; they are desirable in the home landscape for their shape and fall color. Losses to wildlife (birds, tree squirrels, ground squirrels) present the main problem in nut production, for it is almost impossible to protect the nuts of these shrubs from premature harvest by wildlife.

Hardy almond

The so-called hardy almonds are generally unproductive in Illinois. Because they bloom early in the spring, the blossoms are usually killed by frost. When they do bear, the nuts have very poor edible qualities and are difficult to shell.

Butternuts, Japanese heartnuts, and hybrids of the two

These trees are very susceptible to walnut bunch disease. This disease is so severely damaging in Illinois that they are not very productive.

FRUITFULNESS

The most important factors that determine whether nut trees will grow and bear satisfactorily are climate and effective pollination. Winter cold, spring frosts, early fall freezes, drouths, wet humid weather, and length of frost-free growing season affect nut production and, hence, the selection of species and varieties for various parts of the state. Resistance to disease is another criterion for stock selection. The suggested species and variety list is based on observations and studies of tree and nut adaptability in Illinois.

Most varieties of nut trees are partially or completely self-unfruitful and require cross-pollination by another variety for adequate fruit set. Failure to provide for adequate cross-pollination usually results in disappointing yields. See the following list for pollinating requirements.

SUGGESTED SPECIES AND VARIETIES

Black walnut

Northern Illinois: Myers, Sparrow, Beck, Emma K.

Central Illinois: Myers, Sparrow, Beck, Emma K., Hare, Farrington.

Southern Illinois: Sparrow, Beck, Oakes, Hare, Vandersloot, Emma K.

All varieties are self-fruitful.

Persian walnut (hardy English or Carpathian walnut)

Northern and central Illinois: Hansen, Colby, Helmle.

Southern Illinois: Hansen, Colby, Clarence, S-24.

Hansen and Colby are self-fruitful and do not require cross-pollination. Interplant Helmle, Clarence, and S-24 with Hansen or Colby.

Chestnut (Chinese)

Northern Illinois: Nanking, Orrin.

Central and southern Illinois: Nanking, Orrin, Crane, Meiling.

Plant any two of these varieties for cross-pollination.

Filbert (hazelnut)

Northern Illinois: Winkler.

Central and southern Illinois: Winkler, Bixby, Potomac.

Winkler seems to be self-fruitful. Bixby and Potomac are hybrids and should be planted together for cross-pollination.

Pecan (northern hardy types only)

Northern Illinois: None recommended.

Central and southern Illinois: *Group I* — Giles, Major Peruque; *Group II* — Colby, Posey.

Interplant at least one variety from each group for cross-pollination.

Hican (hickory-pecan hybrid)

Northern Illinois: Burton, Henke.

Central and southern Illinois: Burton, Pixley, Jay Underwood, Des Moines.

Pair McCallister with Jay Underwood or Des Moines. To cross-pollinate the other varieties, plant any two; native hickories and Group I pecans will also pollinate hicans.

Hickory

Hybrid (all Illinois areas): De Acers, Stratford.

Shagbark (all Illinois areas): Harold, Anthony, Weschcke, Retzer.

Shellbark (all Illinois areas): Scholl, Ross.

Plant any two of these varieties for cross-pollination.

Sources of nut trees

Louis Gerardi Nursery, Rt. 1, O'Fallon, Ill. 62269

J. L. Morrill, Cunningham, Ky. 42035

John Talbott Nut Nursery, Atlas Road, Linton, Ind. 47441

These nurseries specialize in nut trees. Some nurseries that sell fruit trees and ornamental plants also sell nut trees.

GROWTH REQUIREMENTS

Soils

Most nut species grow more readily on loamy or even sandy soils than they do on heavy clay soils. They also prefer well-drained soils, but pecans can tolerate heavy bottom soils that are subject to occasional flooding. All species are unfavorably affected by shallow soils that have hardpan or rock layers in the upper four feet.

Nut trees prefer slightly acid soils, but walnuts also do well in neutral soils.

Site

Site is an important factor in tree growth and hardiness. Most nut trees, even if they grow well, will have reduced crops on low sites where frost usually comes later in the spring and earlier in the fall. Excessively windy sites can both shorten and distort top growth and may result in premature shaking off of many nut fruits. Windbreaks, as tall trees or as buildings that shelter a tree from the prevailing winds, tend to increase tree hardiness and productivity. Towns generally provide a warmer microclimate, and it may be possible to grow a species or variety in town that would fail in rural areas in the same county.

Spacing

Nut trees (except filberts) will become large trees, requiring considerable space. Some growers prefer to plant trees close together to obtain more early production and then remove the "filler" trees as the planting becomes crowded. A problem with close spacing, however, is the reluctance to remove the filler trees early enough to allow the permanent trees to develop a desirable structure. Filler trees should be removed *before* the branches of adjoining trees meet. The following list suggests the spacing for permanent trees (filler trees may be added temporarily):

Chestnut (Chinese), 50 ft. \times 50 ft.

Filbert, 15 ft. \times 15 ft.

Hican, 60 ft. \times 60 ft.

Hickory, 60 ft. \times 60 ft.

Pecan, 60 ft. \times 60 ft.

Walnut, black, 60 ft. \times 60 ft.

Walnut, Persian (hardy English or Carpathian):

Hansen variety, 35 ft. \times 35 ft.

Other varieties, 50 ft. \times 50 ft.

ESTABLISHING NUT TREES

Nut trees may be established by planting seed, by planting trees, or by grafting onto established seedlings. Planting seed where the tree is desired eliminates the problem of successfully transplanting a tree. But because most nut species are not genetically uniform, variations in tree and nut characteristics are likely. An improved variety can later be grafted onto a seedling tree. Improved varieties can be grafted onto young wild seedling trees in areas where such seedlings are present.

Starting from seed

Nut seeds have natural seed dormancy that must be overcome before they will germinate. The simplest method of breaking dormancy is planting the seed in the fall. The planted nut, however, must be protected from mice and other wildlife. Plant the seed about 2 inches deep. Cut the bottom out of an ordinary "tin" can and cut a 1-inch hole in the top. Push the can into the soil over the nut so that the top is about level with the ground and the hole in the top is directly over the nut. Mulch with straw but remove the mulch in early spring. Tin cans usually will rust out and do not need to be removed; aluminum cans must be removed before they damage the young tree by girdling or confinement.

For spring planting, seed dormancy can be broken by placing the nuts in damp (not soggy) peat moss or sawdust in a closed plastic bag and keeping them in the refrigerator for 6 to 12 weeks or until planting time. Plant the seeds 2 to 3 inches deep early in the spring.

Planting young trees

Young nut trees (except filberts) have a long tap root with very little branching. After transplanting, the development of fibrous roots is slow. These root characteristics mean that nut trees are among the most difficult to transplant successfully. Extra care is required.

Late winter or early spring is the best time for planting. Trees should be planted immediately after they are received from the nursery.

Dig a narrow, deep hole that will accommodate the tap root without bending. Prune off any broken or damaged parts of roots. Place the tree in the hole at the same depth at which it was growing in the nursery. Fill in around the roots with loose soil, tamp firmly, then settle the soil around the roots with a bucket or two of water. Finish filling the hole with loose soil and settle it with more water. Then prepare a small catch-basin around the trunk for future waterings. Protect the trunk from sun damage by wrapping with waterproof tree-wrapping paper or burlap.

Do not put fertilizer in the hole or on the soil surface after planting. Start fertilizer applications one year after transplanting.

During the first growing season the young tree will need watering every 10 to 14 days, depending on rainfall and temperature. The slowness

to develop new roots puts a strain on the young tree. Partial shade during hot weather will help the tree survive the critical first summer. At the first sign of drooping or wilting of the new shoots, provide partial shade if watering does not correct the wilting.

Heavy pruning of the top is essential for survival. After planting the young tree, cut off about half of the top to balance the root loss in transplanting; make sure, however, that several good buds remain.

FERTILIZING

Nut trees growing in deep, fertile soil may produce satisfactory crops without fertilizing; in other soil, annual fertilizing is needed. Apply fertilizer to the soil surface under the spread of the branches, keeping it at least one foot away from the trunk. Apply in early spring before growth starts.

Nitrogen is the element needed in greatest quantity. Lesser amounts of phosphorus and potassium are required. A 20-10-10 or similar analysis mixed fertilizer high in nitrogen is suggested.¹ For young trees up to 6 inches in trunk diameter, apply 20-10-10 at the rate of 1 pound per inch of trunk diameter at breast height. The diameter of a trunk is approximately one-third of the circumference. For example, apply 6 pounds of 20-10-10 to a tree that is 6 inches in diameter (18 inches around the trunk) at breast height. For trees from 7 to 12 inches in diameter, apply 2 pounds of 20-10-10 per inch of diameter. For large trees more than 12 inches in diameter, apply 3 pounds of 20-10-10 per inch of diameter.

These are general suggestions. On infertile soils it may be helpful to increase the quantity of fertilizer by 25 percent. On fertile soils, the quantity of fertilizer may be reduced by 25 percent or more, depending upon the vigor of the tree.

PRUNING

Pruning young trees (except filberts)

Pruning young trees helps them develop a desirable shape and branch structure. As nut trees become larger, pruning is usually limited to removing dead or damaged branches. With a minimal amount of pruning, nut trees usually develop a strong and attractive structure if they have adequate space.

Following heavy cutting-back at planting, several shoots may compete for the position of the new leader or main trunk. When the new shoots are 8 to 12 inches long, select the strongest and straightest one for the leader and pinch out the growing tips of the competing ones. In late winter or early spring each year, shorten the lower branches. If any of

¹ If 20-10-10 or similar analysis mixed fertilizer is not readily available, substitute 1 pound of 12-12-12 plus $\frac{1}{3}$ pound of 33-percent ammonium nitrate for each pound of 20-10-10 suggested.

the lower branches grow vigorously during the growing season, pinch out the growing point. As the tree grows taller, the lower branches can be cut off flush with the trunk; remove a few of these lower branches each year.

Leaving the lower branches on the young tree aids its overall growth by increasing its food-manufacturing ability and providing shade for the trunk during the growing season. Limiting the growth of the lower branches by cutting back and pinching out the tips of vigorous shoots keeps them small and reduces the size of the pruning wound when they are removed later.

Eventually all branches arising from the trunk within 6 to 8 feet of the ground should be removed. This facilitates mowing and other cultural practices.

The pruning practices described here for transplanted trees are also suggested for trees started from seed and for varieties grafted onto seedling trees.

Pruning filberts

Filberts, which are large multistemmed shrubs, should be pruned like lilacs, mockorange, and other large shrubs. Thin out the smaller and weaker shoots each spring, cutting them off at ground level. Remove any damaged, diseased, or weak older stems, cutting them off near the ground level. A shrub with 5 to 7 main stems is suggested. Winkler is usually more bush-like than the hybrid filberts.

CONTROLLING NUT PREDATORS

In much of Illinois, squirrels and birds are a greater deterrent to successful nut production than are plant diseases and insects. In some locations, tree squirrels are numerous enough to take most of the filbert, pecan, hickory, and Persian walnuts before the grower can harvest them at the right stage of maturity. Birds, particularly jays and crows, will harvest filberts and Persian walnuts. Blackbirds and starlings sometimes destroy green nuts of Persian walnuts. Ground squirrels will climb the bushes to harvest filberts and can take pecans and other thin-shelled nuts from the ground. Chestnuts, at least, are protected by their burs until the nuts fall out.

It is well to look at the local squirrel and bird populations and size up their possible effects before putting much time and effort into planting susceptible nut tree species. Chestnuts, hickories, and black walnuts will usually be safer than other kinds.

Losses to tree squirrels can be reduced by using a smooth metal shield placed around the trunk to prevent squirrels from climbing the trunk. This will work if the nut tree is isolated so that squirrels cannot jump from other trees, buildings, or wires to the nut tree, and if the lowest branches are too high for the squirrels to jump to them from the ground.

The shield should be 24 inches wide and placed on the trunk at breast height.

Hastening the falling of mature nuts by shaking limbs and frequently picking up fallen mature nuts will reduce losses.

CONTROLLING INSECTS AND DISEASES

Many insect and disease pests attacking nut trees can be controlled by spray programs, but the selection of pesticides and timing of sprays must be tailored for the type of tree and the specific pests. Detailed pest control information is beyond the scope of this circular.

Powerful equipment is needed to spray large trees adequately. For the noncommercial grower with a limited number of trees, spraying probably is not practical, except for young trees.

Occasionally, foliage diseases or heavy infestations of insects threaten to defoliate the trees. If the trees are young, spraying is suggested. For aphids, use 25-percent malathion at the rate of 3 pounds per 100 gallons (2½ tablespoons per gallon, or 1½ cups in 10 gallons). For worms and caterpillars, use 2 pounds of 50-percent carbaryl (Sevin) per 100 gallons (2 tablespoons per gallon, or 1⅓ cups in 10 gallons).

For fungus diseases of the foliage, such as pecan scab and walnut anthracnose, use 2 pounds of 65-percent zineb per 100 gallons (3 tablespoons per gallon, or 2 cups in 10 gallons). Zineb, carbaryl (Sevin), and malathion are compatible and can be mixed together in any combination.

Good cultural and sanitation practices will help reduce losses from some insects and diseases. Keep trees growing with moderate vigor. In the fall or early spring, rake up and burn or haul away old leaves, hulls, unharvested nuts, and dead twigs. During the growing season, pick up and burn or haul away any nuts that fall prematurely (they usually have worms in them).

MAJOR INSECT PESTS

Pecan weevil

Adult weevils feed on young pecan nuts. This feeding injury may cause the nut to drop. Later in the season, eggs are laid in the husks of both pecan and hickory nuts. The eggs hatch into legless grubs, which bore into the nut and eat the kernel (Fig. 2). Because the pecan weevil over-

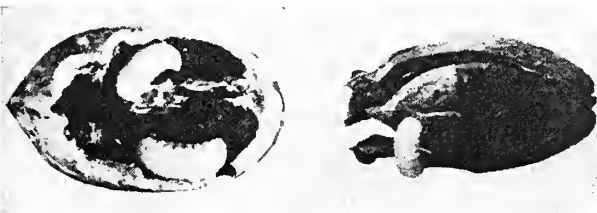


Figure 2. Pecan weevil damage to pecan nuts.

Figure 3. Hickory shuckworm in young pecan nut. After the shell hardens, later generations of shuckworms work in the husk.



winters in the ground, sanitation is not an effective control. To be effective against this pest, sprays must be applied every two to three weeks throughout the summer.

Hickory shuckworm

The adult stage of this insect is a moth that lays eggs on or near pecan and hickory nuts. The eggs hatch into caterpillars that feed on the nut or husks. During the growing season more than one generation may develop. Before the shell hardens, the caterpillars enter the nut and feed on the young kernel, thus causing the nut to drop. After the shell hardens, the caterpillars bore into the husks (Fig. 3). This feeding interferes with normal nut filling and causes black stains on the shell.

The hickory shuckworm overwinters in the husks on the ground. Sanitation will help control this pest in small, isolated plantings. Each fall or early spring, rake up and burn or haul away all husks. During the growing season, burn or haul away any immature nuts that fall.

Walnut huskfly maggot

The maggot overwinters in the ground and emerges in mid- to late summer as a fly. The adult fly lays eggs in the husks of black and Persian walnuts. The eggs hatch into small legless maggots that feed on the husks. Feeding damage stains the shell and may cause discolored and off-flavored kernels.

Damage usually is more severe on Persian walnuts than on black walnuts. Sprays of carbaryl (Sevin), malathion, or carbaryl and malathion should be applied every two to three weeks during July and August for control.

Pecan nut casebearer

These insects overwinter as caterpillars enclosed in cocoons attached to the twigs of pecan, hickory, black walnut, and Persian walnut. At bud break in spring, the caterpillars emerge and feed on the buds, then bore into the new shoots. After feeding for a short time, they pupate and change into moths. The moths start egg-laying about the time the new nuts start to form. The eggs hatch into caterpillars that feed on the new

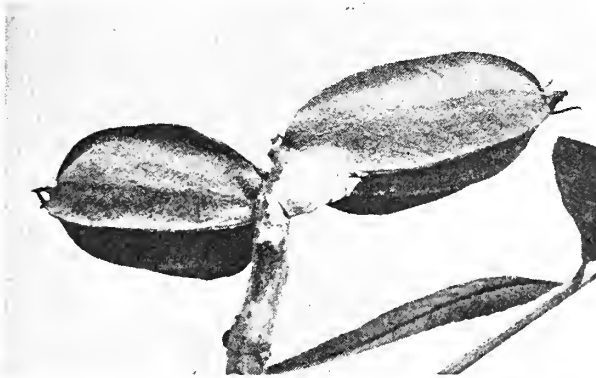
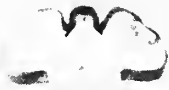


Figure 4 (above). Spittlelike substance produced by spittlebugs on young pecan nuts.



Figure 5 (right). Discolored, bitter spots on pecan kernels caused by stinkbug feeding.



nuts, destroying them. In Illinois there are usually one or two succeeding generations that feed on the leaves and shucks.

Injury is more severe on pecans. Control with a spray of carbaryl (Sevin) when the tips of the young nuts turn brown.

Foliage-eating caterpillars and worms

Fall webworms, walnut *Datana*, eastern tent caterpillars, hickory tussock moths, walnut caterpillars, and other leaf-eating caterpillars and worms frequently attack nut trees. When infestations occur, control with carbaryl (Sevin).

Plant bugs, stinkbugs, and spittlebugs

These juice-sucking insects damage the nuts. Feeding on young nuts may cause the nuts to drop or may cause part or all of the kernel to turn brown and shrivel (Figs. 4 and 5). These pests are general feeders and attack a wide variety of plants, moving about rapidly. They are more prevalent in areas where tall grass and weeds are growing. Keep the nut grove mowed.

MAJOR DISEASES

Chestnut blight

The symptoms on Chinese chestnuts are cankered areas on the bark of a branch or the trunk. New cankers show sunken or swollen areas of bark; later, the bark may split and the foliage may wilt.

Good cultural practices and resistant varieties are the best means of control. Keep the trees growing with normal vigor and prune out cankered branches.



Figure 6. Pecan nut husks infected with pecan scab.

Pecan scab

Scab is a major disease on several southern pecan varieties, but northern pecan varieties, hickories, and hicans are usually not severely attacked.

Symptoms of scab are round or irregular olive-brown to black spots on leaves and young twigs and small, dark, circular spots on the husks of the plants (Fig. 6).

For home plantings, control with good sanitation. Rake up and burn or haul away all hickory, pecan, and hican leaves, shucks, and dead twigs.



Figure 7. Black walnut tree defoliated in late summer by anthracnose infection of the leaves.

Walnut anthracnose

Anthracnose is the most serious disease of black walnuts (Persian walnuts are resistant to it). Anthracnose attacks leaves, nuts, and new shoots. Wet weather during late spring and early summer increases the severity of the infection. Severe infection causes leaves to drop prematurely, sometimes partially defoliating the trees by midsummer (see Fig. 7).

Starting in May or June, small, dark spots appear on the leaves. These spots enlarge and may merge to form dead areas. Tiny, sunken, dark spots develop on the husks of the nuts. Husk infection early in the summer may cause the nuts to drop prematurely or to be improperly filled. Defoliation of the trees may also result in improperly filled nuts with dark kernels.

Sanitation and using the more resistant varieties are suggested for control. Each spring, rake up and burn or haul away all walnut leaves. The varieties in the suggested species and varieties list show resistance to anthracnose.

Walnut blight

Persian walnuts are more susceptible than black walnuts to this bacterial disease. Blight attacks leaves, bark, shoots, and nuts. Infections on new shoots do not grow into older wood, so trees are not killed, but the nuts can be severely damaged and fail to fill properly. Nuts may be infected anytime during the growing season. First symptoms are small, water-soaked spots on the nuts, leaves, or shoots. These spots enlarge and become dark and sunken.

Bordeaux sprays are suggested for control. Use 4 pounds of copper sulfate plus 2 pounds of hydrated (slaked) lime per 100 gallons of water (1 level tablespoon of each ingredient per gallon of water). Fixed copper, 50 to 55 percent copper, at 4 pounds per 100 gallons of water (3 level tablespoons per gallon) may be substituted for the Bordeaux mixture. Spray at bud break and immediately after pollination. During wet seasons, continue spraying every two to three weeks until harvest.

Walnut bunch

Bunch disease affects black walnuts and is especially serious on butternuts, Japanese heartnuts, and hybrids of butternuts and Japanese heartnuts. The causative organism and the method of transmission are not known, but some scientists suspect that a virus or a microplasma is involved.

Lateral (side) buds have a tendency to grow rather than remain dormant. This produces a "witch's broom" type of growth on the infected branches, characterized by bushy, closely spaced lateral shoots with undersized leaves.

Infected branches frequently start growth earlier than normal in the spring and grow longer into the fall. This late fall growth retards normal cold-hardiness development, and the tips of infected branches are winter-killed. Branches infected with bunch disease do not produce normal crops of nuts.

For control cut out the infected branches, making the cut well below the infected area. If the disease continues to spread into other branches, remove the entire tree.



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