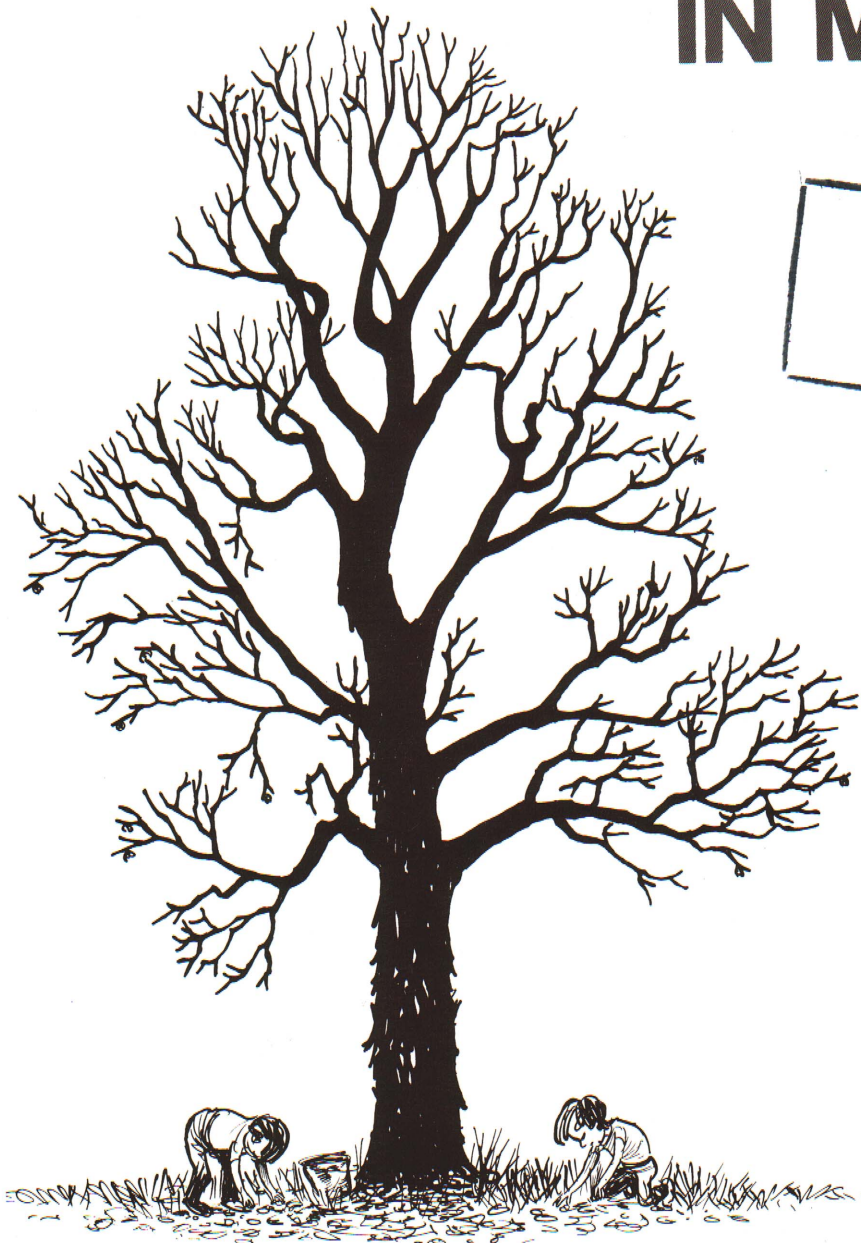


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GROWING NUTS AND MINOR FRUITS IN MICHIGAN

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Michigan State University
Cooperative Extension Service

GROWING NUTS AND MINOR FRUITS IN MICHIGAN

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The popularity of nut trees for ornament, shade and their fruit has increased notably in recent years. Although there are many native species of nut trees in Michigan, the use of named or improved varieties is relatively new. Most Michigan gardeners apparently do not realize that these new varieties are a tremendous improvement over Michigan's native trees.

Several cold-hardy and short-summer tolerant strains of the Persian (English) walnut have been introduced into Michigan and other mid-western states in recent years. The most prominent of these is the Carpathian strain from northern Poland, but others have come from Germany and Russia.

Nut growing in Michigan is limited roughly to the southern half of the lower peninsula. Further north, kernels may not mature because of lack of prolonged warm temperature. Only a few varieties are adapted to areas of cool summers and short growing seasons.

Nut trees are frequently planted in small numbers as a hobby about farmsteads and on suburban home grounds. Commercial nut production is presently limited in Michigan. Persian walnuts and Chinese chestnuts may have commercial possibilities if grown on suitable sites and maintained with good cultural practices.

The landscape value of nut trees should not be

* Drawings are from "The Nut Jar — A Cookbook" used by permission of the Michigan Nut Growers Association. Professor F.L.S. O'Rourke (formerly with the Department of Horticulture) and many members of the Michigan Nut Growers Association have assisted in preparing this bulletin. Photographs — John Warbach; cover illustration — Ozz Warbach.

overlooked. They furnish excellent shade, harmonize well with lawns and grassy areas and are a source of delight to children when the nuts ripen in the fall. The stately hickory is magnificent in fall color and contrasts with the compact clumps of the bush hazels. The soft texture and massive grace of the walnut, the light colored bark of the butternut, and the white spikes of the blooming chestnut add to the interest and beauty of the home grounds. Walnuts are relatively fast growing trees and provide shade faster than most other shade tree species.

Nut trees are ideal for conservation plantings and can be grown in odd corners where it is not desirable to till the soil. They also protect the soil against erosion, and serve as wind barriers for other crops and plantings. The nuts which remain after harvest are an excellent source of food for wildlife. There is also some interest in combining timber and walnut production due to the scarcity of black walnut timber.

NUTS	MINOR FRUITS
Almonds	Beach Plums
Beechnuts	Elderberries
Black Walnuts	Gooseberries
Butternuts	Huckleberries
Chinese Chestnuts	Mulberries
Hazels and Filberts	Papaws
Heartnuts	Persimmons
Hickory Nuts	Sand Cherries
Pecans	Serviceberries
Persian Walnuts	

Growing nut trees, an excellent hobby, should be started as soon as possible because of the time some trees require to reach bearing age. Hickories, especially, require considerable time before they start bearing nuts. One should remember, however, that nut trees are long-lived and planting them is an excellent way to do something for others. At the present time, at last two 4-H clubs in Michigan concentrate on growing nut trees.

Several of the minor fruits are also useful around homes for landscaping value. Amelanchier is an especially nice, small tree for small lots. Papaw is another small tree which is seldom planted. Beach plum is useful as a shrub in home plantings. Mulberries and persimmons are recommended where larger trees are desired.

NUT SPECIES

ALMONDS (*Prunus amygdalus*)

The only almonds hardy in southern Michigan produce nut meats which are difficult to extract. The nut resembles a peach pit and often has to be crushed to open.



BEECHNUTS (*Fagus grandifolia*)

These large trees produce small nuts, but the kernel is very sweet and delicious.



BLACK WALNUTS (*Juglans nigra*)

The black walnut is well adapted to southern Michigan, but for best results should be planted in deep, fertile, moist soils. Grafted varieties are definitely superior to seedlings, but seedlings may be top-worked to good named varieties.



BUTTERNUTS OR WHITE WALNUTS (*Juglans cinerea*)

The butternut is similar to the black walnut in soil preference and may also be used on lawns and pastures. Extremely hardy, it will grow farther north than any other nut tree.



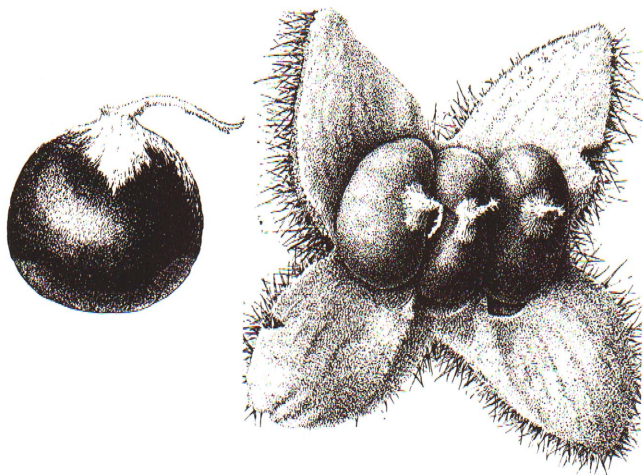
Beechnuts



Black walnut with large plump kernel



Cracking butternuts with an old nut cracker



CHINESE CHESTNUTS (*Castanea mollissima*)

The Chinese chestnut has been generally accepted as a replacement for the nearly extinct American chestnut (*Castanea dentata*). The American chestnut has been wiped-out by the bark disease commonly known as chestnut blight. Only a very few American chestnuts growing in isolation have escaped the disease. The Chinese chestnut is fairly resistant, but not completely, to chestnut blight.

Chestnuts are largely self-sterile. It is necessary to plant more than one variety or seedling to insure fertilization. Seedlings should come from seed nuts of different varieties since seedlings from the same parent variety may not be able to pollinate themselves. Chestnut flowers are apparently pollinated by both wind and insects.

Fruit-set may also be adversely affected by rainy weather at blossoming time (July).



Chinese chestnuts in a chestnut roaster



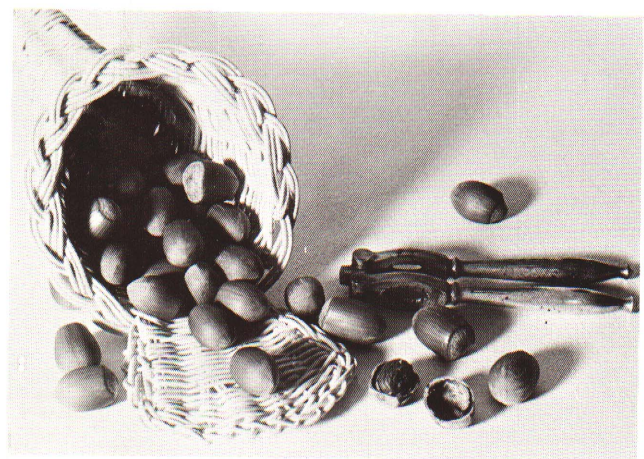
HAZELS AND FILBERTS (*Corylus spp.*)

The European hazel or filbert (*Corylus avellana*) appears to be quite hardy in southern Michigan. The American hazel (*Corylus americana*) is fully hardy (capable of surviving all of Michigan's climatic conditions). Hybrids between the American and European hazels vary in hardiness and other characteristics. Some of these, particularly Bixby, Buchanan and Potomac, may be adaptable to Michigan. True filberts and hybrids between filberts and hazels are sometimes short-lived. Filbert blight may also attack the bushes when they start bearing nuts. Turkish tree hazel (*Corylus colurna*) is a hardy species with a single trunk that grows to a height of 60 feet.

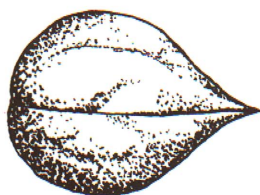
New growth of hazels and filberts often does not mature soon enough in the fall to avoid "freeze-back" the following winter. The catkins (male flowers) emerge so early in the spring that they are frequently killed by spring frosts. Blue jays are another problem, and can steal much of a good crop before the nuts are fully ripe. Squirrels are also a pest in many localities. Allow five or six stems to develop on bush hazels.

Hazel hedges on the home grounds have a high landscape value and furnish excellent fall color. They can be used as screens, windbreaks, or to attract birds and wildlife.

Hazels are self-unfruitful, so two or more varieties must be planted close together to insure adequate pollination. Male and female flowers are produced separately on the same plant and pollen is disseminated by wind.



Hazels or filberts crack quite easily



HEARTNUTS AND JAPANESE WALNUTS

(*Juglans ailantifolia cordiformis*)

Heartnuts are selections from the Japanese walnuts and are usually considered superior. They are fast growing and early bearing. This species is extremely hardy. Production is generally good but the flavor of the kernels is rather bland, somewhat like butternut.

Butternuts cross with Japanese walnuts and heartnuts. Therefore, if you plant nuts of either Japanese walnuts or heartnuts, most of the resulting seedlings will exhibit butternut characteristics. When seedlings of Japanese walnut trees pollinate butternuts the nuts husk clean easily and have a big, wide, prominent ridge where the two halves join. They are commonly called butter-Japs. Nuts from seedlings of butternut-heartnut crosses are called buartnuts.



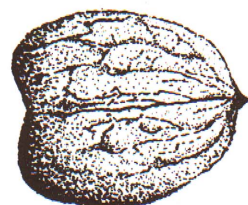
PECANS (*Carya illinoensis*)

Pecans are not suited for nut production in Michigan because cool summers and short growing seasons do not furnish enough warm temperature for kernel development. Occasionally, some nut growers in southern Michigan ripen a few nuts in the top of trees of some of the hardier pecan varieties. Nuts of pecan trees at the Kellogg Biological Station fill about once in four years. *Pecan trees* are hardy in southern Michigan.



HICKORIES AND HICANS (*Carya spp.*)

Shagbark hickories (*Carya ovata*) do well throughout lower Michigan, except in extremely dry or wet areas. Hicans are hybrids between hickory and pecan. They are fast growing, but tend to be shy bearers.



PERSIAN WALNUTS (*Juglans regia*)

Hardy varieties of the Persian (English) walnut are commonly referred to as Carpathian walnuts.

The Carpathian strain of the Persian walnut, *Juglans regia*, was introduced into Canada and the United States in the early 1930's from a cold part of Poland by the Rev. Paul C. Crath. These Carpathian walnuts, being adapted to a relatively cold region with short summers, are hardy to winter cold and usually escape late frosts by remaining dormant in early spring. Their kernels also mature in a short growing season. Although success with Persian walnuts in Michigan depends largely on growing varieties from the Carpathian Mountains, the Hansen species from North Germany and the Broadview from Russia, and their seedlings, are also widely planted.

In some years, several hot, sunny days before May 15th (in central Michigan) may cause the trees to break dormancy too early and lead to freezing or cold injury to the blossom buds.

Table 1 — Food Value of Nuts*

Nut	Water %	Protein %	Fat %	Carbohydrates %	Calories per ounce	Crackout %
Almond	5	21	55	14	190	55
Beechnut	4	22	57	13	200	60
Black Walnut	3	30	58	6	195	26
Butternut	4	28	61	3	215	15
Chinese Chestnut, dry	6	11	8	70	115	77
Chinese Chestnut, fresh	43	6	6	41	70	85
Filbert	6	13	64	5	215	62
Hickory Nut	4	15	67	11	220	38
Pecan	3	12	71	8	225	50
Persian Walnut	3	18	61	14	205	42

* Reprinted from "The Nut Jar — a Cookbook" by permission of the Michigan Nut Growers Association.

MINOR FRUIT SPECIES

'Minor fruits' are those wild or naturalized fruits not grown commercially. Many members of the Michigan Nut Growers Association are interested in breeding and improving varieties.

BEACH PLUMS (*Prunus maritima*)

Beach plums are native to the eastern seaboard. They are lovely, ornamental shrubs that will produce in Michigan. Fruit is the size of cherries, ripens in August-September, and makes excellent jelly. It should be picked before fully ripe, to prevent loss of tang. If you wish to pit, a crank-type cherry pitter works well.

CHOKE CHERRIES — WILD CHERRIES — SAND CHERRIES (*Prunus spp.*)

These are all common throughout the state. Fruit ripens July to August. Add extra sugar when you use choke cherries. Fruit may be pitted with the old crank-type cherry pitter. Freeze as you would sour cherries.

ELDERBERRIES (*Sambucus canadensis*)

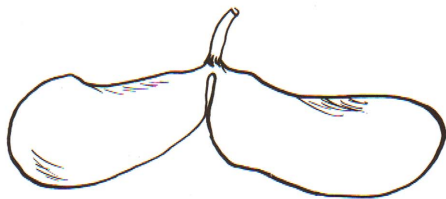
Elderberries are found throughout the state. Fruit ripens in August and September and can be frozen as you would blueberries.

HUCKLEBERRIES (*Gaylussacia spp.*)

Huckleberries are found throughout the state. Fruit ripens in July. Freeze as you would cultivated blueberries.

MULBERRIES (*Morus spp.*)

Mulberries are found in the southern portions of Michigan. This sweet, juicy fruit ripens in July. Freeze as you would blackberries.



PAPAWS (*Asimina triloba*)

Papaws, also known as "Michigan Bananas", grow in southern Michigan. Papaws ripen in October and the fruit is three to six inches long with large, bean-shaped seeds. Papaws taste similar to a banana and have the consistency of egg custard. Pick papaws just as they begin to mellow and handle carefully.

Never let a papaw fall to the ground. Store them in a single layer in a cool place. When they are mellow, eat sparingly, since they are very rich. They can be quick-frozen, but after thawing, are soft and should be eaten at once. They can be kept for two to three weeks in the vegetable compartment of your refrigerator at approximately 40°F.



PERSIMMONS (*Diospyros virginiana*)

Persimmons will grow and produce in southern Michigan. Fruit ripens in October and isn't edible until fully ripened. Otherwise, the fruit is very astringent.

To ripen, put several firm, well-colored fruit into plastic bags with a couple of apples and tie tightly. After three to six days at room temperature, they will be slightly soft and mellow to the taste. The apples give off a harmless gas (ethylene) which causes the fruit to ripen.

SERVICEBERRIES (*Amelanchier spp.*)

Other common names for serviceberries are Juneberry or shadberry. They are common throughout the state and the fruit ripens June to August. Freeze in plastic bags or jars as you would blueberries.

TOXIC EFFECT OF BLACK WALNUT

Many plant species are apparently injured or killed when grown within the root spread of black or Persian walnut trees grafted onto black walnut stocks. Consider this danger before planting black walnut trees on small lots. Tomatoes are a common example of this antagonism. Tomato plants grown within the root zone of black walnut trees usually start to wilt one to two months after planting and die, or are severely injured and don't produce a crop.

The substance of the walnut that injures other plants is called juglone (5-hydroxy-alpha-naphthoquinone), and is produced primarily in the roots. Juglone does not appear to be secreted into the soil. Thus, plant roots must come into contact with roots of black walnut trees or stocks for an adverse effect. Many

other plants than tomatoes show this same antagonism. The antagonism doesn't show up until several years after new trees have been transplanted.

The average limit of the toxic zone from a mature tree is 50 to 60 feet in radius. Occasionally, however, plants 80 feet away show injury. Carefully consider planting site for black walnut trees or Persian walnut trees grafted onto black walnut stocks if other garden or landscape plants are to be grown within the root zone of the mature trees.

Persian walnut seedlings or trees grafted onto Persian walnut stocks do not appear to have a toxic effect on other plants. Butternut has the same toxic effect as black walnut.

A good deal of controversy is associated with the subject of black walnut antagonism. Some individuals report that a plant won't grow under a black walnut tree and others report that the same plant will grow under a black walnut tree. Here is a partial explanation: roots of plants growing near a black walnut tree may not actually come in contact with the tree's roots so that the plants grow normally until this happens.

Most pine trees and evergreens and especially ericaceous plants (azaleas and rhododendrons), usually show injury when grown near black walnuts.

SEEDLINGS OR GRAFTED TREES

Nut trees, like fruit trees, do not "come true from seed". The desired variety must be either grafted or budded in the nursery on seedling rootstocks or on the branches of an established tree.

If you are interested in planting only a few nut trees, buy two or three grafted trees of named varieties of each species wanted. Grafted nut trees usually must be ordered several months to a year before planting. Order early to avoid delay.

Grafted nursery stock is more expensive than seedling trees and often difficult to obtain, but beginners are encouraged to start with grafted trees. Grafted trees also bear much earlier than seedling trees. Many nurseries, which offer nut trees for sale, advertise in garden magazines.

STARTING THE NUT ORCHARD

Site

The site should suit the species to be planted. Black walnuts grow best on relatively moist, deep, fertile soils; Persian walnuts and heartnuts on fertile, well-drained soil; hickories on somewhat drier slopes; and Chinese chestnuts on gravelly or sandy-acid soils. Butternuts do best on deep, fertile, moist soils along creeks where the water table is high. Good soils should be selected wherever available. Nut trees will not thrive and produce on dry, infertile, eroded areas.

Spacing

Hedgerow planting, in which the trees are set closely together within the row, and rows spaced rather far apart, has certain advantages over the "on the square" system. It is well adapted for contour planting and allows space for power machinery. In addition, removal of a tree does not leave much vacant space. Even when land is valuable, it is wise to leave enough space between trees or rows so that the mature tree can perform to full capacity. Suggested spacing for these various species is given in Table 2.

Source

Buy only from a reputable nurseryman who labels the trees as budded or grafted from a tested variety. If seedling trees are bought, try to be sure that they were grown from the best seed obtainable (discussion with other nut growers might be helpful).

Table 2 — Spacings for Various Nut Species

Nut Species	Hedgerow Planting			On the Square	
	Between trees (feet)	Between rows (feet)	Number of trees per acre	Distance each way (feet)	Number of trees per acre
Black Walnuts	40 to 50	70	12 to 16	60	12 to 13
Butternuts	35 to 40	60	18 to 21	50	17 to 18
Chinese Chestnuts	35 to 40	55	19 to 23	40	27 to 28
Hazels and Filberts	12 to 15	15	193 to 242	15	193 to 194
Heartnuts	40 to 45	65	14 to 17	50	17 to 18
Persian Walnuts	30 to 35	60	20 to 25	50	17 to 18

Planting

Plant bare-rooted trees very early in spring, if possible. Keep roots moist after unpacking. Dig hole deep and wide and fill around the roots with good topsoil. Firm well and water. **Do not fertilize** the first year after planting. Mulch with straw or hay and water **thoroughly** every one to two weeks during the first summer. Gradually taper-off watering in late August and September so that the trees can 'harden off.'

Weed Control

Keep an area at least six feet in diameter around each newly planted tree free of weeds and grass for three years. Hand tillage, straw or plastic mulches, or chemicals (Aminotriazole and Simazine) are satisfactory. Chemicals should be applied properly and carefully to obtain adequate weed control and avoid injury to the trees. See Michigan State University Extension Bulletin E-433 "Chemical Weed Control for Horticulture Crops", and follow directions for non-bearing apple trees.

Fertilizing

Fertilizer requirements of nut trees are similar to fruit trees. Mature-bearing fruit orchards need about 50 to 100 pounds of *actual* nitrogen/acre each year. Apple and pear trees require two to three ounces of actual nitrogen for each year of tree age up to one to two pounds of *actual* nitrogen/tree/year. Dwarf, semi-dwarf, or closely planted trees should not receive over one pound of *actual* nitrogen/tree annually.

Nut trees should not be fertilized the first year. One year after planting (in early spring), apply one to 1½ pounds of a good lawn or garden fertilizer, such as 12-12-12, or equivalent, to each tree (two to three ounces of *actual* nitrogen). Increase the rate by about one to 1½ pounds/year/tree until 50 to 100 pounds of *actual* nitrogen are being applied/acre/year. Since hazels and filberts can be planted much closer together than other nut trees, the recommended rates in Table 3 should be divided by the number of trees/acre to obtain rate/tree. Mature hazels and filberts should receive two to three pounds of fertilizer each year. Table 3 shows recommended fertilizer rates for nut trees of different ages and trees/acre. The rates for 200 trees/acre would apply to hazels and filberts. Rates for trees planted at other spacings can easily be obtained by dividing the rate/acre by the number of trees/acre.

A rule of thumb is to apply five to six pounds of 12-12-12, or equivalent, for each inch of trunk diameter for well established trees. The amount of *actual* nitrogen/acre should be calculated to make sure that recommended rates are being used.

Pruning

Nut trees require little or no pruning. Head back straggling branches only to insure better shape and spread. Keep lower branches pruned off if you want to walk under the tree. Remove limbs early if they join the main stem at sharp angles. Sharp angles result in weak crotches and limbs that break-off during wind or ice storms.

Spraying

Young nut trees are usually sprayed only when specific pests occur. A "Spray Schedule for Nut Trees" is available upon request from the Department of Horticulture, Michigan State University, East Lansing, Michigan 48823.

Rodent Control

Young nut trees, particularly Chinese chestnuts and walnut seedlings, are often cut back by mice and rabbits. Use of half- or quarter-inch, mesh wire guards around the base of newly planted trees protects against mice for five to seven years. The wire should be cut 18 x 24 inches for a height of 18 inches. Sink the wire one inch into the ground.

A very effective, easy way to control mice is to broadcast (by hand or with a ground seeder), two percent zinc-phosphide treated, cracked corn and oats, or cracked corn alone. Use at the rate of six to eight pounds/acre. Make the first application the first or second week in October and a second application two to three weeks later in areas of heavy mouse population or where ground cover is dense. Do not forget to treat the border areas to prevent migration of mice into treated areas.

Poisoned peanuts can also be used to control mice. Scatter 10 to 15 peanuts closely around each tree under the mulch. Some nut growers use rosin dissolved in V.M. and naphtha, and paint or spray the stem in late fall. Other commercial rabbit repellents are also available. If rodents are a problem, mulch with sawdust or pine needles instead of straw, hay or grass.

Winter Protection

Young trees are much more susceptible to cold injury than mature trees. For the first two or three winters after planting, it is particularly important to mulch heavily and even furnish wind protection, if possible. **Do not** fertilize or water late in the season.

Livestock Protection

If young nut trees are planted in pastures or other areas where they may be injured by livestock, construct a triangular barrier consisting of three posts with rails or wire.

THE MATURE NUT ORCHARD

Management of the mature nut orchard is practically the same as for fruit trees except that pruning and spraying are needed only occasionally. The sod mulch system is ideal for mature trees, particularly if the area beneath branches is kept heavily mulched during the summer to retain soil moisture. In early spring, apply five to six pounds of fertilizer such as 12-12-12, or equivalent, per inch of trunk diameter. A dressing of barnyard manure is always beneficial.

HARVESTING AND CURING MICHIGAN NUTS

Although nut growers with only a few trees may allow black walnuts and Persian walnuts to fully ripen on the tree and fall to the ground, growers seeking the highest quality nuts knock them off the tree. Before gathering 'wild' nuts, it is wise to crack a few to see that the kernels are full.

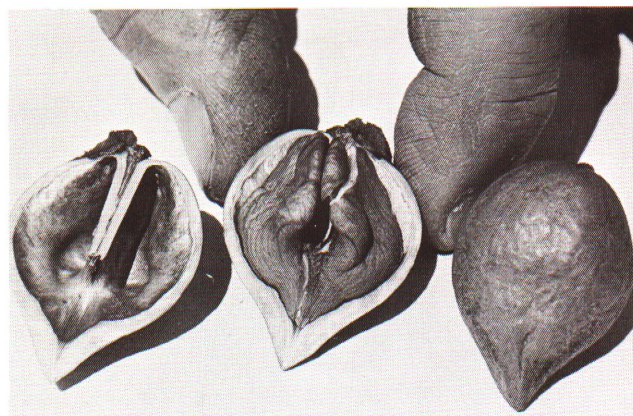
The following general suggestions will help you produce high quality nut kernels. No nuts should be exposed to the direct rays of the sun. To dry or cure nuts, spread them out on a screen not more than three nuts deep, and keep in the shade where they will receive good circulation (50 to 65°F. is the best temperature for drying and curing).

BLACK WALNUTS

As soon as you can dent the hull of several black walnuts on a tree with your thumb, all the nuts on that tree are ready to be shaken down.

Hulling quickly after harvest is very important. Black walnuts have a stain in the hull that will go into, and through the shell, if the hull is left on for any length of time. This stain will discolor the kernels and make them strong tasting.

There are many methods for hulling black walnuts. A hand operated corn sheller or jacked-up automobile wheel in a wooden trough are often



Heartnuts

used for small quantities of walnuts. There are, however, more efficient methods available. Several machines, most of which can be made at home, have been designed to hull black walnuts.

After hulling, the nuts can be washed off in a tub of water or with a hose. If quantity warrants, the walnuts can be placed in a cement mixer with enough water to barely cover them, and rotated for 20 to 30 minutes. Throw some broken pieces of concrete in with the nuts to help clean them. Dump the nuts onto a screen that will allow water and pulp to pass through it readily — half inch hardware cloth will do nicely. Wash the nuts with water from a hose and they are ready for drying.

To dry, place the walnuts in shallow layers (not more than three deep), in a shaded, cool, dry place with good air circulation for about two weeks.

CHINESE CHESTNUTS

Gather the nuts as soon as they fall from the burs. The nuts drop over a two week period. Collect the nuts every day or two — daily, if mice are a problem.

Put nuts on a screen in a shady, cool, rather humid, well-ventilated location for one to several days to cure.

Table 3 — Recommended Fertilizer Rates for Nut Trees*

Age of Tree	Pounds of Actual Nitrogen			Pounds of 12-12-12		
	Per Acre	Per Tree		Per Acre	Per Tree	
		20 Trees/A	200 Trees/A		20 Trees/A	200 Trees/A
2 years	2 to 4	.1 to .2	.01 to .02	20 to 30	1 to 1½	⅛
5 years	9 to 15	½ to ¾	.05 to .08	80 to 120	4 to 6	½
10 years	21 to 33	1 to 1½	.1 to .15	180 to 270	9 to 13½	1 to 1½
15 years	34 to 50	1½ to 2½	.2 to .25	280 to 420	14 to 21	1½ to 2

* Based on the rate of 50 pounds of actual nitrogen/acre/year for mature orchards. Recommended rates for mature orchards are 50 to 100 pounds of actual nitrogen/acre/year.

Chinese chestnuts have starchy, rather than oily, nuts. The nuts lack flavor at the time the burrs open and the chestnuts fall, but after drying slowly for a few days in a cool place (50 to 65°F.), the starches change to sugars and the flavor improves tremendously. **Don't let chestnuts get too dry.** The nuts should remain nearly as plump as at harvest time. To soften overly dried chestnuts, soak in water or steam.

An easy way to store chestnuts is to seal and freeze the whole nuts in air-tight glass or plastic containers. They can also be stored at 30 to 45°F. in one to five gallon cans with a few holes in the top for air circulation. Some growers place the chestnuts in a root cellar immediately after harvesting where they are stored until used.

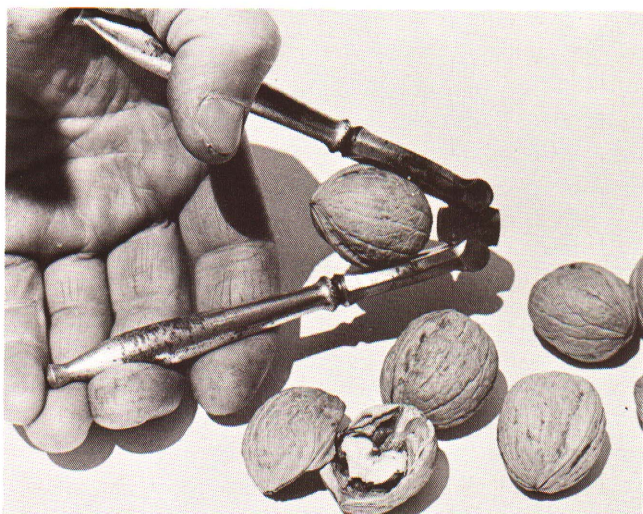
HICKORY NUTS

Hickory nuts should be gathered promptly and placed on screens in the shade to dry. After the kernels become crisp, place the nuts in a mesh bag in a cool, airy place. Since the oil in hickory nuts becomes rancid very easily, dry and store them in a dry, cool place as soon as possible.

PERSIAN WALNUTS

Nuts can be allowed to fall to the ground, or the tree can be shaken and the nuts harvested immediately when about 75% of the nuts on a tree show split hulls.

Dry the nuts on a screen the same as for black walnuts. They will probably need less time to dry than black walnuts. Watch carefully for mold in humid weather.



Cracking Persian walnuts with a small nut cracker. Another method is to insert a stiff knife blade into the base of the nut and twist the two halves apart.

OTHER INFORMATION

To determine if a nut is properly dried, extract a few kernels. If the kernels are crisp, they can be stored. Store nuts in mesh bags out-of-doors in a garage or shed, or in a cool, underground cellar until they are ready to be cracked.

If black walnuts and butternuts are very dry, soak them overnight in a bucket of water. Drain and dry briefly before cracking. Soaking softens the shell and causes the kernel to swell—making cracking much easier. The kernels will be quite moist when extracted and must be dried before storing.

After cracking, nut kernels should be placed in tight jars and refrigerated below 40°F. If this is not done, nut oils may become somewhat rancid and flavor impaired. The household refrigerator is suitable for this purpose. The kernels can also be frozen in air-tight jars.

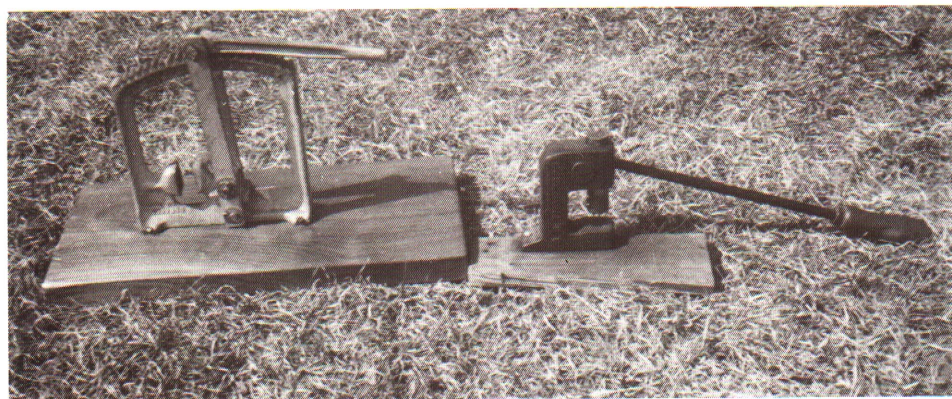
Flavor in walnuts and hickories is associated with a high content of oil, which is dependent upon a sufficiently warm and long summer to bring about full ripening. Thus, a cool, short summer may mean below standard flavor.

Nuts in Michigan are usually marketed locally and unshelled. Appearance is important, so shells should be *clean*. They should also be graded so that they are uniform in size, shape and general appearance. When properly harvested, cleaned and cured, Michigan-grown nuts have high quality. The flavor of Michigan Persian walnuts is thought to be superior to that of the West Coast Persian walnuts. Many prefer Michigan hickories and black walnuts over those shipped-in from southern areas.

PRODUCTION PROBLEMS

In certain years, some nut trees may fail to bear a crop. Occasionally, nutlets are produced, but drop before they mature. Or kernels may be shriveled and shells poorly filled at harvest time. Causes may be:

1. *Freezing or cold injury* to the blossom buds by late spring frosts. Some varieties start growth earlier in the spring than others.
2. *Cold and rainy weather at pollination time* which prevents proper wind dispersal of pollen.
3. *Poor pollination*, usually due to lack of sufficient cross-pollination from trees of other varieties causes small nutlets to drop in early summer. Lack of soil moisture and cold weather after pollination may also result in dropping of small nutlets. Two or more varieties, which bloom at the same time, will insure cross-pollination. Many varieties and individual trees are not fertilized by their own pollen.



Heavy duty nut crackers,
used on
black walnuts,
butternuts, hickories,
Persian walnuts, etc.

4. *A short, cool summer* resulting in shriveled or unfilled kernels in some varieties. Other varieties mature earlier and are more suitable for areas with short, cool summers. Since summers vary in length and warmth in the same region, some years are better than others for kernel maturity. Many nut growers think that bunch disease causes shriveled kernels in black walnuts.
5. *Poor nutrition.* Nut trees should be well fertilized to bear well.
6. *Insufficient moisture.* Conserve soil moisture by mulching with straw, weeds, etc., to a depth of six inches from near the trunk to well beyond the branches. The mulch may be raked back in September to facilitate harvesting. Watering may be beneficial during prolonged dry periods.
7. *Defoliation by insects or disease.* Leaves are necessary to provide nutrients for the development of nut kernels. If the trees are partially defoliated by caterpillars, leaf-spot disease, or other organisms, the kernels may be immature or shriveled at harvest time.
8. *Shade.* Full sunlight is needed for the production of nutrients necessary for proper nut development. Partially shaded trees seldom produce nuts of good quality.
9. *Close spacing.* When trees are planted too closely together, they compete with each other for min-

eral nutrients, water and light. Under these conditions, they are seldom very productive.

10. *Alternate bearing.* Some nut trees, particularly black walnuts and hickories, bear heavy crops every two to four years and light crops the other years. This is characteristic of certain specific varieties.

ASSOCIATIONS

Both experienced and beginning nut growers can find associations valuable. There are state and national associations of nut growers.

The Michigan Nut Growers Association holds several meetings, conducts grafting demonstrations, and publishes several issues of a newsletter each year. The Northern Nut Growers Association holds an annual meeting, usually in the eastern U.S. or Midwest, and publishes a comprehensive annual report. They have also published a "Handbook of North American Nut Trees."

The Michigan Nut Growers Association has published "The Nut Jar — A Cookbook" which includes 260 nut recipes and 30 minor fruit recipes. To purchase a copy of this cookbook, or for further information about either of these associations, contact the Department of Horticulture, Michigan State University, East Lansing, Michigan 48823.

NUT TREE INFORMATION

	BLACK WALNUT	BUTTERNUT	CHINESE CHESTNUT	HAZELS AND FILBERTS	HEARTNUT	HICKORIES	PERSIAN WALNUT
Climatic Region	Well adapted to southern Michigan.	Extremely hardy.	Chestnuts are about as hardy as peaches. Planting should be confined to areas where peaches are winter hardy.	The American hazel is fully hardy, but the European hazel or filbert isn't. Hybrids between these two species vary in hardiness.	Extremely hardy.	Shagbark hickories do well throughout lower Michigan, except in extremely dry or wet areas.	Early maturing varieties are satisfactory as far north as M-46 in Michigan and perhaps farther along the lake where the growing season is 150 days or more.
Soil	Does best in deep, fertile, moist, drained soils.	Does best in deep fertile, moist soils.	Well-drained gravelly type of soil, suitable for peaches, is ideal. Soil should be slightly acid. Avoid heavy, strongly alkaline and poorly-drained soils.	Good water drainage is essential.	Will grow on infertile sandy soils, but does better on deep, fertile soils.	Prefer light, well drained, loamy soils.	Needs deep, fertile soil which retains moisture in summer. Swampy, poorly-drained areas and droughty, eroded hillsides are not suitable.
Air Drainage	Avoid frost pockets.	Will do better in frost pockets than black walnuts.	Good air drainage required. Late spring freezes may kill new shoots and tender leaves if planted in a frost pocket.	Good air drainage is essential.	Avoid frost pockets.	Avoid frost pockets.	A fair amount of air drainage is desirable. Trees in frost pockets may have blossoms and new leaves killed by late spring frost.
Site	Yards, fence rows, on northern or eastern slopes, permanent pastures, large lawns.	Yards, fence rows, permanent pastures, large lawns, low hillsides, river banks.	Does best on slopes and hilltops where there is good air drainage.	Do well on moist sites if low drainage is adequate. Low areas that form frost pockets should be avoided because of both winter cold and spring frost.	Yards, fence rows, large lawns.	Low hillsides and river banks.	Does well in pastures and other grassy areas if sufficient soil moisture and nutrients are available. Level or gently-sloping land is best.
Varieties for Michigan	Adams, Allen, Beck, Eimer Myers, Grundy, Snyder, Sparrow, Stambaugh, Thomas.	Crackezy, Lingle, Love, Sherwood, White.	Abundance, Crane, Kuling, Meiling, Nanking.	Bixby, Buchanan (tooth American hazels), Italian Red, Latson, Potomac, Reed, Rush, Winkler.	Fodermaier, Mitchell, Walters, Wright.	Abscoda, Glover, Kirtland, Lingenfelter, Romig, Wescheke.	Broadview, Colby, Ficks, Gerstemaier, Gratot, Greenhau, Hansen, Lake, Merkel, Metcalfe, McDermid, McIntyre, McKinstler, Meyer No. 1, Somers, Winchell W.
Culture	Weed control is necessary for newly planted and small trees. Mulching with straw or wood shavings is beneficial, particularly during dry periods in the summer. Trees need little or no pruning. An occasional limb may be shortened or removed to maintain symmetry.	Weed control is necessary for newly planted and small trees. Mulching with straw or wood shavings is beneficial, particularly during dry periods in the summer. Trees need little or no pruning. An occasional limb may be shortened or removed to maintain symmetry.	Weed control is important, especially with young trees. Mulching should help. Keep sod clipped (4 to 5 times/year.) Extremely low croches should be avoided by removing limbs to a height of 2 to 4 feet above ground. Scaffold branches may then be selected 18 to 24 feet apart to form a modified leader type of tree. Subsequent pruning will be very light.	Weed control is necessary for newly planted and small trees. Mulching with straw or wood shavings is beneficial, particularly during dry periods in the summer. Trees need little or no pruning. An occasional limb may be shortened or removed to maintain the symmetry of form.	Weed control is necessary for newly planted and small trees. Mulching with straw or wood shavings is beneficial, particularly during dry periods in the summer. Trees need little or no pruning. An occasional limb may be shortened or removed to maintain the symmetry of form.	Weed control is necessary for newly planted and small trees. Mulching with straw or wood shavings is beneficial, particularly during dry periods in the summer. Trees need little or no pruning. An occasional limb may be shortened or removed to maintain the symmetry of form.	Pollen shedding and stigma receptivity usually occur at different times. Therefore, 3 or more different varieties should be planted to insure proper exchange of pollen.
Time of Bearing	Seedling trees come into production in 8 to 12 years. Grafted trees will start to bear earlier.	Named varieties usually begin bearing 2 to 4 years after planting.	Seedling trees come into bearing at about 7 years of age. Grafted trees start to bear about a year after planting.	Named varieties should start bearing the third year after transplanting, if properly cared for.	Named varieties usually begin bearing 2 to 4 years after planting.	Named varieties usually bear in 10 to 20 years.	Seedling trees come into production in 6 to 10 years. Grafted trees bear earlier.
Yield	Variable. Tend to have alternate bearing habits. One to three bushels of hulled nuts per mature tree.	One to several bushels of hulled nuts per mature tree.	Yields vary, but usually average about 20 to 50 pounds of hulled nuts per mature tree.	One to 6 quarts of hulled nuts per mature bush.	One to 6 bushels of hulled nuts per mature tree.	One half to 1½ bushels of hulled nuts per mature tree.	Mature trees have been known to yield 200 lbs. of hulled nuts per tree (about 6 bushels). Good care is necessary to produce good yields. Average yields of 50 to 125 lbs. can be expected.