Two Promising Fruit Plants for Northern Landscapes

by EDWARD GOODELL

In recent years a trend toward "edible landscaping" has begun to emerge as a natural extension of standard gardening. Two books on the subject have been published (Britz; Creasy), and in Massachusetts a bill creating the innovative Massachusetts Fruition Program was passed by the legislature in 1980. With a budget of $64,000 this program promotes the planting of food-producing trees, shrubs, and vines.

Perhaps the most desirable characteristic in landscape plants is an ability to thrive in low-maintenance situations. This eliminates many commercial fruit species, however, as these usually have been highly selected for fruit production under the assumption that adequate care will be provided. Fortunately, there are many food-producing plants that, for various reasons, have never been developed. On the Arnold Arboretum grounds alone I found about 150 species, from *Actinidia arguta* to *Zizyphus jujuba*. The usual reason that such plants are not developed is that they have a deficiency in some characteristic, such as yield, keeping quality, or ease of propagation, that would limit their success as a commercial crop. On the other hand, their broader-based genetic makeup often allows them greater environmental adaptability, and they are therefore less needful of maintenance.

I chose the two plants described here for the quality of their fruits and their adaptability in low-maintenance situations. Many other plants deserve equal attention, including the juneberry, flowering quince, hazelnut, walnut, mulberry, elderberry, hickory, pine nut, grape, and various *Prunus* species.

Three major climatic factors must be considered in growing woody food plants in the Northeast: minimum winter temperatures, occurrence of late spring and early fall freezes, and the relatively short, cool growing season. Carefully choosing a favorable planting site (e.g., with good air and soil drainage) will enhance a plant's performance in any given climate. *Actinidia* will grow reliably in northern New England and New York (USDA plant hardiness zone 4; see map on page 119). The persimmon is recommended only for zones 5 and 6 in the Northeast.

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The American Persimmon, *Diospyros virginiana*

If the world's population were polled as to its favorite fruit, the choice would probably be the persimmon. This may be surprising to most Westerners, but it is understandable when one takes into account the fact that the Oriental persimmon (*Diospyros kaki*) is the primary fruit in the diet of more than a billion Chinese, Japanese, Taiwanese, and Koreans. This persimmon, known as the kaki in the Orient, is also gaining a deserved popularity in the warmer portions of this country (USDA zones 7–10) both as a handsome landscape plant and productive orchard tree. Its bright orange, apple-sized fruits are grown commercially in California and now regularly appear in United States markets. Approximately 1000 cultivars exist in the Orient and vary widely in shape, size, color, and flavor. Selected through centuries for their superior fruits, these cultivars originated from the astringent, seedy, small-fruited wild species that is now rarely seen in its native China (Spongberg 1977).

Unfortunately, the Oriental kaki cannot be recommended for areas where winter temperatures dip below 0°F. Thus, for a cold-hardy persimmon we must turn our attention to the native American persimmon (*Diospyros virginiana*). Its large natural range extends as far north as southern Connecticut, west to Iowa, and south to Texas and Florida (Little). Under cultivation, American persimmons originating in the northern part of the range are quite hardy throughout USDA zone 5 (or −20°F average minimum temperature). Even though some cultivars of *D. virginiana* have been selected during the past hundred years, the species remains relatively wild compared to the highly domesticated Oriental kaki. But the success story of its Oriental relative may be an indication of what is in store for this native American fruit tree.

Throughout the persimmon's natural range, the fruits have been long valued as food. Hernando DeSoto's expedition to the Americas in the early 1500s reported persimmon pulp being dried by Native Americans. These "loaves" of dried persimmon kept from one year to another. Native Americans are also known to have added persimmon pulp to corn bread, and they even ground the seeds into a meal (Griffith and Griffith 1982). A beer made from fermented persimmons and honey locust pods was a common drink among southeastern tribes (Carr).

DeSoto's chronicler considered them "better than all the plummes of Spaine" and noted that "they make far better prunes of them." In commenting about the persimmons known to the Roanoke colony in 1585, Thomas Hariot wrote "they are not good till they be rotten (but then) . . . they be lushious sweet" (Roush).

It was Captain John Smith who first described the woeful surprise of eating an unripe persimmon. He noted, "If it not be ripe, it will drawe a man's mouth awrie with much torment." The incredible astringency of the unripe fruit accounts in part for the fruit's lack of

widespread acceptance. But, as Captain Smith went on to say, "when it is ripe, it is deliscious as an Apricock." Subsequent colonists agreed and used persimmons in making puddings and beer. The present inhabitants of the natural range of *D. virginiana* also enjoy wild fruits, and commercial sources of trees for home orchards are now available. Each year, during the last weekend in September, some 25,000 visitors join the town of Mitchell, Indiana, in celebrating the persimmon harvest with a feast of persimmon culinary delights.

A 1978 market study conducted in Illinois evaluated the commercial potential of prepared persimmon products (Garrison). Although 85 percent of the participants were initially biased against persimmons, almost all responded favorably to the products' taste and expressed an interest in making persimmons a regular part of their diet.

The astringency of unripe persimmons is mainly responsible for the persimmon's unpopularity. For the fruit to be at its best, it must ripen on the tree before the leaves fall. This has been a major limiting factor in the Northeast, because persimmons are adapted to areas with relatively longer and hotter growing seasons. However, a few cultivars that have proved themselves in the North are available now. A second limiting factor is that the ripe fruits are soft and do not ship or store well. New artificial ripening techniques may soon allow unripe, firm fruit to be mechanically harvested, shipped to distant markets, and stored for long periods. But shipping qualities are not a crucial factor for the home orchardist, and persimmons can be preserved easily in home freezers. Persimmons are also considered difficult to transplant. They do have special transplant requirements, but if a few guidelines are followed they can be successfully established in good vigor.

The American persimmon has many attributes to recommend it. The ripe fruit has a rich flavor and high energy content. The texture of a ripe persimmon is somewhere between that of a baked apple and firm custard. The trees are productive over a wide range of soil types. They are long-lived, beautiful in fruit, and relatively unaffected by pests.

D. virginiana is a variable species. Several recognized botanical forms exist (Spongberg 1977), and two races have different numbers of chromosomes (Baldwin and Culp). One race (a tetraploid with 60 chromosomes) is geographically centered in southern Appalachia. This race is probably the primitive *D. virginiana,* its current range approximating the species' northern limit during the Pleistocene glaciations. The second race (hexaploid with 90 chromosomes) is thought to represent a more recent evolutionary change. It predominates in areas north and west of the southern Appalachians. This race, which may deserve a separate subspecies rank, is more vigorous, cold hardy, and drought tolerant than the first. The two races are generally not capable of fertilizing each other. Most of the cultivars suited for the North have been selected from the second race because it also tends to have larger fruit that ripens earlier (McDaniel 1982).

D. kaki also has 90 chromosomes, and efforts have been made to obtain an interspecific hybrid. Russian botanists have reportedly bred several hybrids, but similar attempts in this country have failed to yield a verified hybrid (McDaniel 1982). Seeds produced from controlled cross-fertilizations between the two species usually do not germinate, or if they do, the resultant seedlings show characteristics of the maternal parent only. Future attempts using embryo culture techniques may yield successful hybrids that combine the size and sweetness of the Oriental kaki with the greater cold hardiness of the native American persimmon.

Under natural conditions the persimmon grows best on alluvial bottomland and terraces, where it sometimes reaches approximately 100 feet and has a long slender trunk. It is also found on sandy well-drained soils, where it more commonly grows in a shrubby habit to 33 feet tall.

The American persimmon is usually found in deciduous woodlands in association with maple, poplar, hickory, oak, sassafras, or dogwood. It is very tolerant of shade, germinating and persisting in the understory but fruiting only lightly. Persimmons can also utilize full light conditions, as shown by their ready colonization of abandoned fields, fence rows, and other disturbed areas such as roadsides. Stumps and fire-damaged trees usually sprout profusely, and roots commonly sucker, producing persimmon thickets. The freely growing persimmon has been both praised as a conservation plant and cursed as an agricultural weed (Fletcher).

The dark persimmon bark is deeply fissured into square scales, in an alligator-skin pattern. Persimmon wood is close grained and heavy. The sapwood is light colored and the heartwood is dark brown like that of another member of the *Diospyros* genus, the tropical ebony. Persimmon heartwood is not suitable for lumber because it checks excessively during the drying process. However, the hard heartwood has been used for small wooden products, such as tool handles and golf-club heads, in which it has the attribute of polishing as it wears. Unfortunately, the heartwood develops so slowly that the persimmon has never become a commercially important timber tree.

The persimmon is very adaptable to site and soil conditions. Under cultivation, it grows satisfactorily "on very sandy soils, and on heavy clay loams, within a wide pH range" (McDaniel 1971). After an initially rapid growth rate, persimmons generally settle down to a pace of about a foot per year. Open-grown trees rarely grow taller than 30 to 50 feet. They have a roughly pyramidal shape. Young trees have ascending branches and an oval outline, but with maturity the branching becomes more sinuous and horizontal or even slightly pendulous. A specimen planted in 1896 at the Arnold Arboretum is a splendid example of the picturesque zig-zag branching of mature trees.

The deep green foliage often has an unusual slate-colored tint, which makes a persimmon tree stand out in the summer landscape.

Flowers of an American persimmon tree. Al Bussewitz photo.

Flowers of A. kolomikta. *Al Bussewitz photo.*

The individual leaves are oval and 4 to 6 inches long. They tend to droop from their stout petioles, giving the whole tree a languid quality. Fall coloration may be deep yellow mottled with green and red, but in northern areas leaves often fall without changing color dramatically. In winter the American persimmon may be readily distinguished by "the characteristic bark pattern; lack of terminal buds on branchlets, as well as solitary (vascular) bundle scars centered in the leaf scars . . ." (Spongberg 1979).

The leaves expand in May, and the flowers appear on the current season's growth when the leaves are about half-grown but do not open for several weeks. The flowers are often borne in practically every leaf axil. They are not readily noticed at a distance, however, because they are small and a faint green or cream color. The most apparent sign at flowering is the activity of bees visiting the nectariferous flowers. C. D. Eddy in 1927 described the honey as being of a "very fine quality" and noted that persimmons were rated as one of the more important nectar-producing plants in North and South Carolina. Wind pollination is also a possibility with the very light and powdery pollen.

Persimmon fruits remain light green as they enlarge during the summer. With the arrival of fall, they finally turn amber to deep orange with a light bloom on the skin. Better selections are 1 to 2 inches in diameter, about the size of a small plum. The average fruit is 50 percent high-carbohydrate pulp, and the remainder is seeds and skin. Hard freezes will darken and wrinkle the fruit, but persimmons often hang on the tree through midwinter.

Seedling persimmon plants begin flowering at four to eight years of age. The male plants are generally more precocious than the female (Campbell). A grafted cultivar will bear fruit within three years. A test planting of four-to-six-year-old cultivars yielded an average of 50

Deeply fissured square scales of the bark of the American persimmon tree Al Bussewitz photo.

pounds per tree (Claypool). Wild trees, estimated to be 10 to 15 years old, averaged 73-pound yields. Most persimmon trees can bear regular, heavy crops. However, if pollination is excessive, an extremely heavy crop can be set. This may result in limb breakage, inadequate ripening, and a light crop the next year. Maximum yields are reached when the trunk diameter approaches 1 foot (approximately 25 years). Uncrowded trees should remain productive for another 50 years. American persimmons planted well over 80 years ago in Urbana, Illinois, show no signs of declining yields (McDaniel 1982).

The reproductive biology of *D. virginiana* is interesting in its complexity. Persimmons are mainly dioecious, with the urn-shaped staminate and carpellate flowers occurring on separate trees. The staminate flowers (on "male" trees) are about the size of a blueberry flower (⅜ inch in diameter). The carpellate flowers (on "female" trees) are about twice as large, and the petals are more spreading. Carpellate flowers are borne singly, whereas staminate flowers are normally in short, stalked clusters of three. The flower pedicels are persistent, so the sex of a tree can be easily determined even during winter.

Frequent exceptions to the dioecious conditions have been observed on cultivated plants. It was first noticed that some female plants would produce seedless, parthenocarpic fruit (without fertilization) when grown in isolation from pollen-bearing trees. Later, when some of these plants began to produce occasional seeded fruits, it was discovered that staminate flowers were occurring on weakly growing branches of normally female trees. Conversely, vigorously growing shoots of male trees will sometimes produce carpellate or perfect (bisexual) flowers.

This variable reproductive expression has been best documented in the persimmon cultivar 'Early Golden' and its descendants. J. C.

McDaniel of the University of Illinois, an authority on the American persimmon, has ventured the following theory about these plants.

"The fact that 'Early Golden' sometimes (probably frequently on old trees) can be self-pollinating with the aid of insects and that several of its descendants can, too, leads to the speculation that it may have descended from a line of sometimes self-pollinated trees, going back no one knows how many years. It could have originated from a naturally inbred line, and the inbreeding may account for the high concentration of good qualities (size, earliness, good texture and flavor) found in 'Early Golden' and a fairly high percentage of its predominantly carpellate progeny. The inbreeding could result, as it does in other ordinarily cross-pollinated crops, in some reduction of fertility; this may partially account for the fact that 'Early Golden' and its kin seldom mature the full complement of 8 seeds per fruit that is found in ordinary seedling *D. virginiana* when adequately pollinated at flowering season. Breeders have just begun to do controlled inbreeding with the 'Early Golden' family to test these theories experimentally."

Seedless fruit are smaller and their taste and texture may not be as good as those of seeded fruit (McDaniel 1973). Both yield about the same amount of pulp, because the flesh of seedless fruit contains fibrous materials in place of the undeveloped seeds (McDaniel 1982). However, seedless fruit seem to ripen earlier, a valuable characteristic in the North. Where space is limited, the ability to bear crops without a pollinator is another asset. One male tree to 12 females is the general guideline for correct pollination. Grafting a male branch onto an otherwise female cultivar is a good space-saving technique.

In the North early ripening is a crucial characteristic, as American persimmons are edible only when fully ripe. Unlike the Oriental kaki, which may be ripened artificially by one of several methods, the American persimmon must attain a soft, near ripe state before it will respond to methods of removing astringency. Most northern cultivars originated in the Midwest. They are all perfectly hardy in bud and wood throughout USDA zone 5 (−20°F minimum winter temperatures). Yet when taken north to the Great Lakes and east to New England, many cultivars may fail to ripen properly in summers that are relatively short and cool compared to those of the midcontinent. Members of the Society of Ontario Nut Growers are actively breeding early-ripening varieties for the lakes region. Presumably these will be adapted to New England as well. The search is also on for male trees that will flower and pollinate the first female blooms of the season and thereby lengthen the persimmon's ripening time (Campbell). The recommended cultivars for the Northeast are described on page 118.

Growing Persimmons

The main obstacle faced by the prospective persimmon grower in the Northeast is obtaining good plant material, and grafted cultivars are in short supply. The seeds and seedling trees that are generally available from many mail-order nurseries are almost always of un-

known sex. A few nurseries do offer suitable cultivars for northern climates (see page 129). Cultivar scionwood for grafting is also often available, and requests may be honored for seed from parent trees that are known to produce superior offspring.

Perhaps the best means of obtaining a desired cultivar is to graft it oneself. Nut and fruit organizations are the best source of seed and scionwood of good selections (see page 129). Scionwood is also available at some nurseries, a few of which will do custom grafting upon request. Grafting or budding methods are similar to those used with apples. Both grafting and budding are done in spring or summer using a seedling rootstock that has proved to be winter hardy.

Stems that did not bear fruit during the previous growing season are preferable as scions because those that have borne fruit are known to die during the following winter. Spring grafting and budding are best done when the buds begin to swell (late April in Boston, Massachusetts). Grafts may succeed as late as June if the scions are completely dormant, but early grafts with a longer growing season ahead of them are more likely to survive the first winter. A small plastic bag covering the scion and graft union works well to prevent desiccation. This may be removed gradually after the buds break and the leaves begin to unfold. All growth from the understock should be removed as soon as the union has clearly healed.

Summer budding is also successful. August is the best time, but it may be done as late as four weeks previous to freezing weather. Budwood that is smaller in diameter than the rootstock allows for easier insertion of a bud. After winter, stock plants should be girdled just above grafted buds that have survived. Tying the vigorous new growth of buds to the dead portion of the rootstock above the graft union will prevent wind damage. Otherwise, a stake should be provided for support. The easiest way to propagate persimmon plants is from seed. Of course, the sex of a seedling cannot be known until it flowers, which may take more than four years. Cultivars in the 'Early Golden' group have a reputation for producing better than average offspring. With so few cultivars selected specifically for northern regions, raising the seedlings of the better cultivars that are available may be the best way for most people to obtain a persimmon tree adapted to their needs. Seedlings can be planted in a group and all but the better fruited plants subsequently eliminated.

It is advisable to collect seeds from ripe fruit. Excessive heat, cold, or drying can cause persimmon seeds to lose viability, but seeds have been known to germinate after six years of cold stratification (McDaniel 1970). Three months of cold stratification is needed for good germination. Sow persimmon seed in fall or early spring, about 1 inch deep with some additional light mulch on top to help retain moisture. Rodent predation has not been reported to be a problem. Seeds will germinate within a month in soil temperatures above 60°F. The seedlings quickly develop a long taproot and are tolerant of adverse conditions (Fowells) but perform best with ample moisture and

no competition from weeds. Well-grown seedlings can reach approximately 1 foot high the first season and grow another 3 feet the second season.

If persimmons are grown in a nursery, the time to transplant them to a permanent site is at the beginning of their third growing season. A couple of factors make American persimmons notoriously difficult to transplant. The young trees have deep taproots and long surface roots, which are fleshy and inevitably injured during digging. A prior root pruning will induce fibrous lateral rooting and enhance transplanting success. Also, persimmon roots do not regenerate until after the top is fully leafed out and the soil has warmed. Luxuriant new growth is often mistaken as a sign of a successfully established transplant. If supplemental watering is discontinued, the top may wilt, because the damaged roots cannot supply the transpiring leaves with adequate water.

American persimmons can be successfully transplanted if a few precautions are observed. The most important is to warm the soil early to encourage rapid root regeneration. A black plastic mulch is a good way to do this, and it will also retain moisture and eliminate weed competition. The plastic may be applied before the planting date to speed the warming process. The best transplant hole is large and of good tilth. Pruning the top back ⅓ to ½ of its size will equalize damage done to the roots. Persimmon roots are normally dark throughout and should not be mistakenly pruned off as dead. Young persimmon trees respond favorably to irrigation with warm water from a slow-flowing hose exposed to the sun. White latex paint or an opaque trunk guard will prevent sun scald on the trunk. To help the young transplant harden off for winter, remove the plastic mulch and stop watering in August. The two secrets of successful transplanting are: (1) maintain a warm, moist soil and (2) do not mistake lush new growth as a sign that care is no longer needed.

Transplanted trees should not be fertilized during the first season, except for perhaps a cup of bonemeal incorporated into the transplant hole. Satisfactory yields are possible without special treatment, as shown by the heavy yields of wild persimmons and the similar performance of some trees at the Arnold Arboretum. Even so, fertilization will probably increase yields, especially on poorer sites. For maximum production the following regime has been recommended by the Society of Ontario Nut Growers:

(1) Apply 1 pound of 10-10-10 fertilizer for each inch of trunk diameter until fruiting age.

(2) With the onset of heavy fruiting, switch to a 5-10-15 formulation.

(3) Prevent fertilizers from contacting the trunk; that is, broadcast outward beneath the canopy.

(4) Only fertilize during early spring. Heavy feeding during the growing season can shock a persimmon tree, causing it to drop its leaves.

American persimmons, which grow relatively slowly (12 inches per year) and remain compact, have an interesting self-pruning characteristic. After two or three seasons of growth, some fruit-bearing shoots will dry up over the winter and release by abscission before the next growing season. This growth habit minimizes the need for supplemental pruning. The optimum tree form is a low-headed pyramid with widely spaced scaffold branches arranged in a spiral pattern around the central leader. Summer pruning will direct the tree's energy into fruit production rather than vegetative growth, keeping the tree small and productive. Spacing for mature trees on good soil needs to be about 35 feet.

All accounts agree that the American persimmon is practically pest free in the North. Observation of the Arboretum's *D. virginiana* specimens during 1981 revealed no insect pests on leaves, flowers, or fruits. Some plants did seem to have a minor leaf-spot disease. In areas with short growing seasons, the below-optimum photosynthesis in diseased leaves could result in fruits that are less sweet.

With autumn's approach persimmon fruits change color from light green to yellow and finally to a deep golden orange. A few soft fruits may be noticed on the ground. At this point the texture of persimmons still hanging changes from firm to increasing degrees of softness. At its softest the fruit will usually separate from the calyx, leaving it and the pedicel attached to the twig. This is a fully ripened fruit, and it should be delicious. A fruit that will separate from its calyx is very soft and must be handled carefully, however. Because of this, and since persimmons ripen gradually, it is often easier to make a few large harvests of fruits that are less than fully ripe.

Hand picking is the gentlest harvest method, but shake harvesting is less tedious and causes little damage if it is done over a cushioned ground cover. The best containers for collecting fruit are shallow, to minimize crushing the soft, ripe fruits.

The astringency of unripe persimmons is thought to be caused by the chemical compound leucodelphinidin (Griffith and Griffith). As a single molecule leucodelphinidin causes astringency, but polymeric chains of leucodelphinidin longer than four molecules lose their ability to react with the oral mucosa. Ethylene gas evolved during natural ripening or supplied artificially removes astringency by catalyzing the polymerization of leucodelphinidin molecules. The use of ethylene gas is the only artificial ripening method that Eugene and Mary Griffith acknowledge in their book, *Persimmons for Everyone*. In their opinion the prevalent notion that freezing can remove astringency began because the natural ripening period and the frost season often coincide.

American persimmons that are still firm and astringent can be fully ripened by being subjected to 50 ppm ethylene gas for 24 hours and then allowed to sit for several days at room temperature. Creating such a high concentration of ethylene gas is not practical in the average household kitchen, however.

American persimmon (D. virginiana)

In more practical curing methods it is unclear how ripe a persimmon must be when it is picked. The Griffiths state emphatically that the fruits must begin to soften on the tree. Others report successful off-tree ripening of firm, green fruit when it is stored either at room temperature or in a refrigerator. As with the Oriental kaki, this characteristic probably varies from tree to tree. I have not attempted to ripen green fruit artificially.

Storing the fruit in a plastic bag will enhance ripening by retaining natural ethylene gas at a higher concentration. Adding an apple or banana, preferably a ripe one, will further hasten the ripening process. Fruit softness is a measure of ripeness and may be checked without opening the bag. Tree-softened persimmons will ripen fully within a few days or a week, depending on the method used and their initial degree of ripeness. Ripe fruits keep for several weeks in a refrigerator.

Orientals eat their persimmons fresh, dried, and frozen, but never cooked. Traditional American dishes such as persimmon pudding show that cooked preparations can be good, too. Even so, low temperatures and short cooking times are recommended to avoid adverse changes in texture and flavor. The Griffiths' book is a thorough exploration of the culinary delights of persimmon cookery, with over 250 recipes for soups, salads, breads, frozen desserts, puddings, pastries, beverages, and other delicacies.

In preparing persimmons it is advisable to avoid ordinary carbon steel utensils, which will turn persimmon flesh unattractively dark. Stainless steel is best. Aluminum alone will not stain persimmons, but be wary of aluminum coatings on a steel base. If a utensil is going to darken the fruit, it will do so within five minutes of contact; otherwise it is safe to use. Pulping is usually the first step in persimmon preparations. A sieve with $^{3}/_{16}$-inch openings will separate the pulp from the seeds and skin and yet is not so fine that pulping is difficult.

Persimmons are ideally suited to preservation by freezing. The flesh remains in good condition and flavorful for years, even if thawed and refrozen. However, it is best to freeze the pulp in individual plastic bags of a convenient size for thawing one at a time. Whole fruits may be frozen and eaten like popsicles or pulped after thawing. Several persimmon recipes from the Griffiths' book are offered below. Either American or Oriental persimmons may be used.

Persimmon Spice Pudding

1½ cups flour
½ teaspoon salt
¾ teaspoon double-acting baking powder
¼ teaspoon cloves
¼ teaspoon nutmeg
½ teaspoon cinnamon
4 cups persimmon pulp
½ cup sugar
½ teaspoon soda
1 cup milk
1 egg
½ teaspoon vanilla
¼ teaspoon lemon extract
2 tablespoons butter, melted

Sift dry ingredients together. Combine persimmon pulp, milk, egg, vanilla, lemon extract, and melted butter. Combine two mixtures, stirring well. Pour into greased baking dish. Preheat oven to 350° and bake 45 to 50 minutes. Serve hot or cold with whipped cream, or with a hard sauce.

Persimmon Ice Cream

1½ quarts cream (30 to 40 percent milk fat)
½ pint milk
1 cup sugar
1 teaspoon soda
3 cups persimmon pulp

Beat first four ingedients lightly, adding in above order. Thoroughly chill mixture (with persimmon pulp chilled separateiy). Partially freeze before adding persimmon pulp, then complete freezing.

Persimmon Leaves Tea

Gather green persimmon leaves, wash them, and make tea by steeping them in boiling water. The tea has a pleasant flavor, suggestive of sassafras.

Or spread the leaves on paper in a warm place until they are thoroughly dry. Pack them in lightly sealed jars and heat the jars with their contents in a very low temperature oven for about 30 minutes. Remove the jars from the oven and tighten the lids immediately. If the jars are airtight the leaves will be dry and sealed in a partial vacuum. If properly done the leaves will keep indefinitely.

Dried persimmon leaves tea is considered better than that made from fresh ones. Persimmon leaves are high in vitamin C (ascorbic acid).

Persimmon Gingerbread

⅓ cup shortening
⅓ cup sugar
1 egg
¾ cup sour milk, buttermilk or yogurt
⅔ cup dark molasses
¾ cup persimmon pulp
½ teaspoon soda
1 cup whole wheat flour
¼ cup powdered milk
½ cup wheat germ *or* wheat germ flour
3 teaspoons double-acting baking powder
1 teaspoon cinnamon
1 teaspoon ginger
½ teaspoon salt

Cream the shortening and sugar. Add egg, sour milk, molasses and persimmon pulp. Stir well. Sift the remaining dry ingredients together and add them to the moist mixture with no more than 20 strokes. Oil a ring mold or 8-inch square loaf pan and dust with flour. Pour the batter into the pan and bake at 350° for about 45 minutes. Be careful not to overbake. Serve with whipped cream or sauce.

Persimmon Beer

Thomas Jefferson, the third president of the United States, enjoyed persimmon beer. Try it and judge for yourself!

1 peck persimmons 1 pound bran
8 gallons water

Combine persimmons, bran and about 1 gallon of warm water. Wash and mix them well. Place the mixture in a tub or barrel with a thin layer of clean straw on the bottom. Add the remainder of the water and set in a warm place to ferment. When the beer is ready for use, the persimmon pieces will rise to the top. Draw off the clear liquid and add molasses or brown sugar if additional sweetening is desired. Place brew in bottles, jugs, demijohns or a keg. Stopper tightly and store in a cool place. The beer is ready for use when cold, immediately after bottling, but if stored for two to three weeks in a cool, dark place it will improve in flavor. The beer is light, lively and pleasant tasting.

Persimmon Cultivars

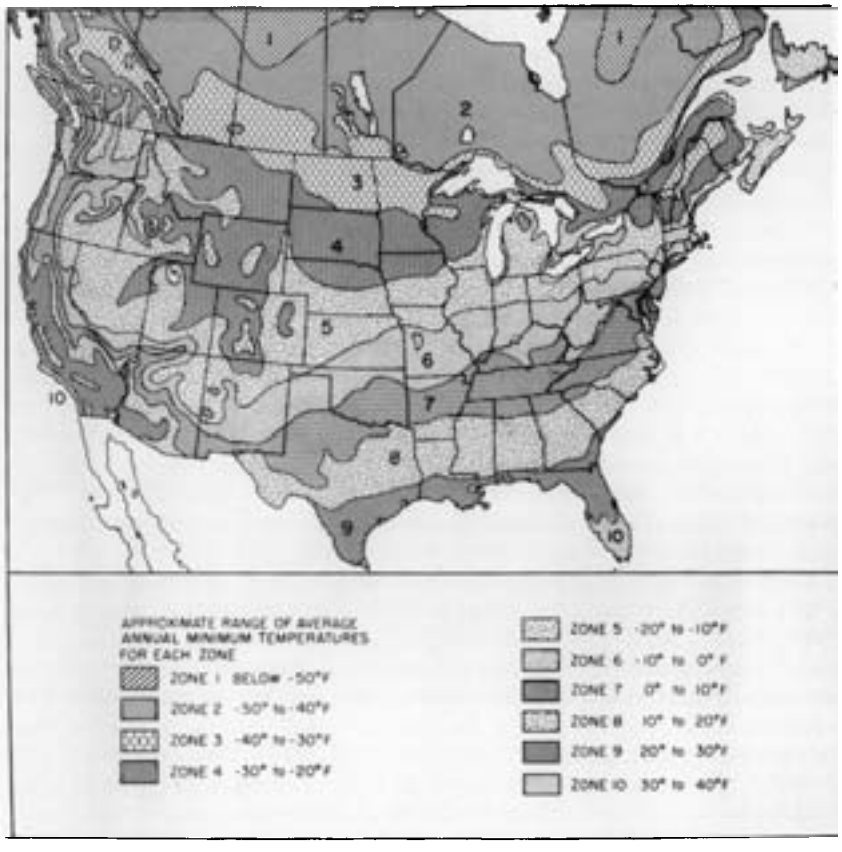
The following cultivars are the most suited to the Northeast (USDA zones 5 and 6). (Unless otherwise noted, my descriptions are drawn from those of Gerardi, Slate, Brooks and Olmo, and McDaniel 1973 and 1982.)

'Early Golden' is the standard for early ripening, nonastringent fruit. Originating near East St. Louis, it has been widely propagated since 1880 and is popular for its large, firm fruit with few seeds. It generally ripens in the first week of October in Ontario (Campbell), but during recent short, cool growing seasons it has failed to ripen properly (Society of Ontario Nut Growers). 'Early Golden' trees have a spreading branch habit and dense foliage. The young plants fruit precociously. With age they can occasionally self-pollinate by staminate flowers borne on weakly growing branches. 'Early Golden' is the matriarch of a family of selected cultivars that includes many of those best suited to northern regions.

'Garretson', introduced from Pennsylvania in 1920, is apparently a first- or second-generation offspring of 'Early Golden'. It has similar foliage and seed characteristics. From 1940 to 1966 it withstood winters at Geneva, New York, without injury. In the Geneva climate it is more productive than 'Early Golden' and matures its fruits more fully, beginning in early October. The fruits are orangy yellow with a red blush and heavy bloom. They are almost spherical and slightly smaller than those of 'Early Golden', about 1⅜ inches in diameter. 'Garretson' fruit has very good flavor, few seeds, and tender skin. 'Garretson' bears in the second season after grafting and like 'Early Golden' produces staminate flowers and self-pollinates with age. Its yields are just about optimum, heavy but not overly so, which would delay ripening in northern areas. 'Garretson' was the choice cultivar at the Geneva Experiment Station in 1966.

'Meader' is the sole plant surviving from a 1947 'Garretson' seedlot grown near Rochester, New Hampshire. 'Meader' regularly survives −25°F and matures 1¾-inch seedless fruits in the cool New Hampshire summers. Experience with 'Meader' at Geneva has shown a tendency towards overbearing. Even so, the largest of the variably sized fruits surpassed in size the fruit of any other cultivar grown there. The dull yellow fruits, which are somewhat furrowed and have a heavy bloom, sometimes develop unattractive dark patches. The skin is relatively tough compared to that of other cultivars, but the flesh is tender and may have a slight but not objectionable astringency. On the whole, the fruit quality is good but not excellent. 'Meader' will produce seeded fruit when grown near a suitable pollinator. Since some fruits of the original plant, which is isolated, have been observed to have seeds in recent years, it can be assumed that it, too, produces some staminate flowers and self-pollinates.

'Killen', selected about 1915 in Delaware, is another probable offspring of 'Early Golden'. It is similar to the latter in texture and seed



U S Department of Agriculture plant-hardiness zones in the United States and Canada

shape and in the time required for ripening. The fruits, which are slightly larger than those of 'Early Golden', begin ripening a few days later and continue over a longer season. 'Killen' performs well in southern Connecticut and Geneva, New York. Like 'Early Golden' it is strong growing, precocious, and produces some staminate flowers with age. 'Killen' has a record of producing high quality offspring: 'John Rick' and 'Florence' are two of its progeny, as are the male cultivars 'George' and 'Mike'.

'John Rick' was selected by J. C. McDaniel in 1958 and is receiving widespread acclaim for its large, handsome fruits. The orangy yellow fruits are blushed red and are up to 2 inches in diameter. The skin and flesh are tender and flavorful. Its small, soft calyx, which does not puncture other fruits in storage, combined with its overall attractiveness, makes 'John Rick' a prime cultivar for fresh marketing. It ripens about the same time as 'Early Golden' or perhaps slightly afterwards.

A five-year-old plant growing in St. Elmo, Illinois, yielded 42 pounds of fruit in 1977 (Wills). 'John Rick' has not shown an ability to produce staminate flowers like other members of the 'Early Golden' family. Seedlings of 'John Rick' are very vigorous and precocious but show moderate susceptibility to leaf diseases. If 'John Rick' can be shown to ripen fruit dependably in New England, it will then be highly recommended for its fruit qualities.

'Florence' has smaller fruit than its sibling 'John Rick', but its small seeds give it a high flesh-to-seed ratio, and its delicate flavor is one of the better among northern cultivars. Staminate flowers have also been observed on 'Florence'.

'Wabash', another cultivar suitable for northern climates, is not a member of the 'Early Golden' family. It was selected from the wild in southern Illinois and has smaller fruits and redder flesh than any of the cultivars named thus far. The fruit is sweet, aromatic, and seedless where pollinators are absent. It ripens even earlier than the 'Early Golden' group, beginning in mid-August at Urbana, Illinois. The leaves of 'Wabash' color more than those of most American persimmon trees, making it an attractive yard tree.

'Morris Burton' was introduced by a farmer from Mitchell, Indiana, who noticed that his cows always ate its fruits first. Most people who have tasted it agree with the cows, rating 'Morris Burton' as the most delicious persimmon they have ever eaten. 'Morris Burton' fruit is relatively small and soft but is among the earliest to ripen. Another advantage of 'Morris Burton' is that the ripe fruit falls free of the calyx.

'Juhl' and an older cultivar 'Hick' have shown some promise in trials at Geneva. The fruit color of both is clear yellow with a slight red blush and heavy bloom. The fruit of each is about 1⅜ inches in diameter, but 'Hick' is variable in size whereas 'Juhl' is uniform. 'Juhl' may have small dark spots on its skin. Both have tender skin and flesh without astringency. Neither plant overbears and the fruits of both ripen just before those of 'Garretson'. On the whole, the merits of each approach those of 'Garretson', with 'Juhl' perhaps slightly superior to 'Hick'.

'Richards', 'Evelyn', 'Utter', and 'Pieper' are mentioned in the Society of Ontario Nut Growers newsletter as selections with promise for areas with cool, short growing seasons. The latter three will produce seedless fruit when not pollinated. 'Pieper' ripens fruit in Geneva, and its foliage turns a beautiful yellow before falling, usually with the first heavy frost.

In areas where wild persimmon trees are not abundant, a male tree is needed for pollination if the female cultivar does not have the parthenocarpic ability to set fruit without being pollinated. There are two male cultivars of merit. 'William' is a handsome plant that provides copious pollen over a long period. It is the probable parent of 'John Rick' and 'Florence', as well as 'George', another heavily pollinating male.

Actinidia arguta: The Cold-Hardy Relative of the Kiwifruit

Actinidia arguta is a vigorously growing fruiting vine native to northeast Asia. It is a cold-hardy relative of the kiwifruit (*A. chinensis*), which has enjoyed a meteoric rise to commercial success in the last two decades. Large plantings of kiwifruit in California and New Zealand now supply northern markets.

Unlike the kiwifruit, *A. arguta* has rarely been cultivated except as an ornamental. Even though the fruits are sold regularly in northern Chinese markets, they are obtained solely from wild plants. The Chinese name for *A. arguta* is *van zhou*, the "soft date" or "juicy date." In Korea it is known as the "tara" or "wild fig." Elsewhere, Occidentals have named it the "Siberian gooseberry," "hardy kiwi," and "bower Actinidia," the last to denote its climbing habit. A member of the Arboretum staff, Peter Del Tredici, has dubbed it the "bowerberry," a name that appeals to me. A single name needs to be settled on.

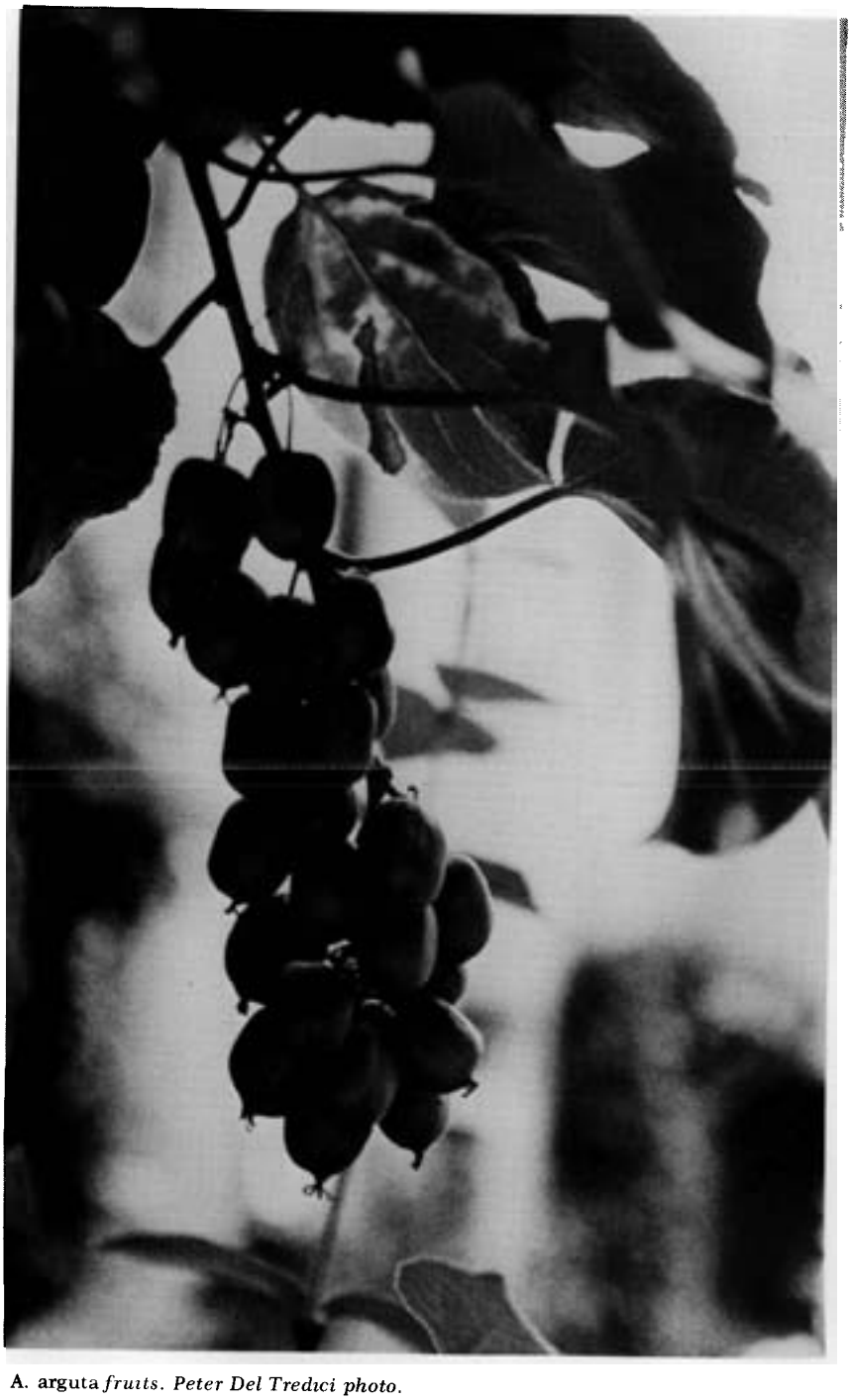
All of the approximately 35 species of the genus *Actinidia* are native to eastern Asia (Li). The center of their geographical distribution is southwestern China. Two species are tropical, but the others are found primarily in the hills and mountains of temperate areas. The fruits of all species reportedly are edible, but those of *A. arguta, A. kolomikta,* and especially *A. chinensis* are most often collected for human consumption.

Five species, *A. arguta, A. kolomikta, A. polygama, A. melandra,* and *A. purpurea,* have been grown outdoors at the Arnold Arboretum and are apparently hardy to −5°F. The first three are native to northeastern China (Manchuria), which has a climate similar to New England's. The kiwifruit cannot stand our winter temperatures without protection and requires a long ripening season. *A. arguta* is the only species I have observed fruiting in New England.

The native habitats of *A. arguta* are in eastern Siberia, Manchuria, northern China, Korea, and Japan at altitudes from 330 to 6600 feet. *Actinidia* plants typically grow within the forest or at its edge. They are tall-growing vines (to 100 feet), often climbing into the forest canopy. The long arching shoots provide support by twining and by thrusting themselves upward on short divergent branches. The plants also grow as thickets in open areas, climbing over boulders and smothering small shrubs. *A. arguta* plants are very cold hardy. One explorer reported thick ice near the roots of a Manchurian specimen on June 10 (Woeikoff).

As a species *A. arguta* is polygamodioecious, which means that the flowers of most individual plants are either functionally male (staminate) or female (carpellate). However, there are some plants with perfect flowers, while others may have unisexual flowers of both sexes on the same plant. Furthermore, some plants vary their sexual expression from year to year as maples do.

The flower buds appear in May but remain tightly bound in their



A. arguta *fruits. Peter Del Tredici photo.*

sepals until June, long enough to avoid damage from late frosts. They are borne in small clusters from the leaf axils of the current season's growth. The blooms are strikingly beautiful but are largely hidden beneath the foliage and persist only a week. The individual flowers, about ¾ of an inch in diameter, have black anthers surrounded by five waxy white petals. They have a fragrant scent resembling lily-of-the-valley, which attracts bees and other pollinating insects. Pollination may also occur by wind since the pollen is very light and dry.

A. arguta is among several species in the genus that have been cultivated as ornamentals. The bright red petioles lend an exotic quality to the glossy green foliage, which is unusually resistant to disease and insects. The plants can thrive on a variety of soils, even under conditions of neglect. Because of these qualities the *A. arguta* vine can be recommended for its landscape value alone. Its only fault is its great vigor, which can be troublesome in small spaces.

The fruits of *A. arguta* are luscious. Their flavor is similar to that of the kiwifruit, which has been described as combining a multiplicity of flavors as various as strawberry, cantaloupe, banana, fig, watermelon, gooseberry, and rhubarb. Actually, it has its own very distinctive flavor, ranging from tart, during early ripening, to sweet at full ripeness. I much prefer fresh *A. arguta* fruits to seedless table grapes because of their unique, sophisticated flavor. In texture *A. arguta* resembles a fig or very ripe peach. The tiny seeds, like those of figs, have a barely perceptible crunch when eaten. *A. arguta* fruits are usually oblong in shape (¾ by 1¼ inches) and sometimes blocky with flattened sides. Somewhat bigger than large grapes, they weigh 5 to 10 grams. Unlike the kiwifruit, which has a pubescent skin that must be peeled, the smooth-skinned green fruit of *A. arguta* is eaten whole. Cross-sectional slices of the fruit reveal a glistening pattern of lime-green flesh surrounding a ring of chocolate-colored seeds embedded in a paler green core.

The fruits have a variety of culinary uses. They have traditionally been collected from wild plants and eaten fresh or preserved by drying in the sun. Dried fruit are cooked in breads and pastries or reconstituted for pudding and stew. Underripe and acidic *A. arguta* fruit can be used in pickles and relishes. In vitamin C content it reportedly equals the kiwifruit: 250–380 mg per 100 grams, or ten times that of a lemon. The fruits have a mild laxative quality.

The sliced fruit is visually appealing, a piquant addition to salads, especially fruit salads. It is also excellent in frozen preparations like slush coolers, frozen sherbet, and ice cream and can be preserved or used to make syrup. Fermented *A. arguta* fruits make a good wine with a particularly pleasant and interesting bouquet. (Wine made from kiwifruit is reported to be high quality, of a Sylvaner Riesling character.)

Kiwifruit keeps for an extraordinarily long time (4 to 12 months), and preliminary experience with *A. arguta* suggests that it will, too. In one experiment firm-picked fruit has been ripened to perfection in

one month when held at standard room conditions. Ripe fruit has been stored in a household refrigerator for six to eight weeks with little or no deterioration in quality. Firm-picked *A. arguta* fruit in cold storage can probably equal the kiwifruit in its ability to keep through the winter. The slightly flattened sides of *A. arguta* fruits should make them easy to pack and ship with minimal damage.

Elwyn M. Meader, a breeder of many successful crop plants, has grown fruiting *A. arguta* vines for more than 20 years, and he believes *A. arguta* has high potential as a commercial crop for northern climates. Meader lives in Rochester, New Hampshire, where temperature minimums frequently reach −25°F, yet his vines bear fruit every year. They were given a test on Christmas Eve 1980, when temperatures rapidly dropped from 27°F at night to −20°F the next morning with high winds. Even this shock, which affected some apple cultivars in the region, had no adverse effect on the next season's *A. arguta* harvest. And there is no reason to believe that Meader's vines are unusually hardy. None of the couple of hundred seedlings he has grown in the past has shown evidence of winter injury. The report is the same about fruiting vines growing in a small area around Norfolk, Connecticut, known as the "icebox of Connecticut" because of its occasional −30°F minimum winter temperatures. *A. arguta* plants grown in Lithuania have reportedly withstood −45°F.

It is possible that *A. arguta* could achieve commercial success like its relative the kiwifruit, particularly north of areas where table grapes can be grown reliably. Delectable taste, pest resistance, storage qualities, and absolute cold hardiness are impressive attributes of this undeveloped fruiting vine.

Much research and development is still necessary for *A. arguta* to realize its commercial potential. For instance, its productivity has rarely been evaluated. A. D. Woeikoff, in his survey of Manchurian economic flora, states that few plants can equal its fruit-yield to foliage-area ratio. The horticultural staff at the Isabella Stewart Gardner Museum in Boston estimates at least 10 gallons of fruit is collected annually from two large vines in their courtyard. A more specific report from Lithuania calculates 110 pounds of fruit per vine. Based on this figure, an acre of *A. arguta* could be expected to yield 11 tons of fruit. Regardless of the exact yields, it is safe to say that some *A. arguta* vines fruit profusely on an annual basis. Seedlings flower in five to seven years and cuttings in three to four years. Several vines that are at least 60 years old show no signs of declining yields.

A. arguta and some relatives are available as seeds, seedlings, or rooted cuttings from a very few sources (see page 129). Evidence shows that many more male vines are produced from seeds than female or bisexual ones; perhaps as many as 5 to 10 males for each female. For optimum fruit set, a male plant for pollination is a good idea, though probably in an inverse proportion to what occurs naturally (1 male for 5 to 10 females). Ideally, bisexual selections will be made available with the ability to self-pollinate or at least cross-pol-

A arguta *flowers*

linate with another fruiting cultivar. These can then be vegetatively propagated and the need for devoting space to nonfruiting male vines eliminated.

Propagation

A. arguta was grown and distributed by several nurseries after it was introduced into this country near the turn of the century. Many of the plants I have found date from these early introductions. Arboreta, public and private gardens, and the grounds of institutions are likely sites of fruiting plants.

Fresh seeds germinate much better than ones that have been allowed to dry out. Each fruit contains as many as 200 seeds. Separating the seeds from the pulp is done as it is with tomatoes. The pulp is macerated and allowed to soak in water for several days. After it is agitated, only the pulp and nonviable seeds will float. These can be poured off and the seed remaining on the bottom saved. To ensure uniform germination, the seeds need a period of damp chilling and should be mixed with three times their volume of damp (not moist) peat moss. This mixture must then be sealed in a plastic bag and stored at normal refrigerator temperature for about three months. When it is ready for sowing, the entire stratification mixture may be spread in a flat of sterile media. A light covering of milled sphagnum moss over this will reduce damping-off disease, to which the emerging seedlings are susceptible. Approximately 60 percent to 85 percent of the seeds germinate within 40 to 50 days. Another satisfactory method of germinating the seeds is to store the whole fruit in a refrigerator for a month or longer. After this the fruit can be macerated and the entire pulp planted without separating the seeds. The pulp will decay, and within one or two months after planting the seedlings will begin to emerge.

The seedlings rapidly develop an extensive root system and should be transplanted before they become visibly crowded. They respond well to fertilization and ample spacing, making rapid growth of one to several leaders 1 to 2 feet long. Slightly shaded nursery conditions are recommended, but containerized plants have been successfully grown on asphalt surfaces exposed to full sun and unimpeded winds. The thick waxy leaves seem to resist desiccation, but they can be wind-flailed when new and tender.

Actinidia can also be propagated vegetatively like grapes, with a similar high rate of success. Leafy cuttings taken in July and placed under mist root well. No single rooting hormone can be recommended at this time, but alcohol dips have been observed to be injurious. About 50 percent of dormant cuttings taken in spring just before the buds break also root and establish when simply stuck in an outdoor nursery row of good tilth. Profuse callus formation can inhibit root formation in some cases. For this reason summer budding and dormant grafting of the fruit are preferred by some nurseries. But the grafting must be done well in advance of the spring sap flow, or excessive callus will interfere with the graft union's healing process. Sections of root will sprout readily. One- and two-year-old stems can be rooted from layers by pegging them beneath a moist, friable soil.

One- to two-year-old plants may be transplanted to their permanent location. An eventual growing area of 13 by 13 feet is advisable for these vigorous climbers. Plants of unknown sex may be grown much closer together until their bearing qualities can be evaluated and the less desirable plants rogued out. Care must be taken to allow some pollen-bearing plants to remain. These will preferably be within 35 feet of the fruit-bearing plants and will flower at the same time.

The literature on kiwifruit culture stresses the importance of sturdy trellis supports, and this would also apply to *A. arguta*. Trellises suited for grapes are unsatisfactory under the weight of mature kiwifruit vines heavily laden with fruit. An overhead arbor casts a cool shade and allows for easy picking of the hanging fruit. Fruits harvested from the ground after dropping are usually in acceptable condition. Wherever a climbing vine is needed, these vigorous growers can rapidly fill the space.

Pruning probably will enhance yields. The fruiting occurs on the basal portion of relatively short stems. These can be distinguished by their close internodes of less than 2¼ inches as compared to the long, arching vegetative vines with internodes generally longer than 3¼ inches. Without pruning, the vegetative vines overgrow and shade future fruiting vines. Their photosynthesis will be reduced, causing them to initiate fewer flower buds for the next year's crop. Early June is a good time to prune the long vegetative shoots to about eight leaf nodes from their base. This will direct the sun's energy into fruit production and formation of the next year's flowers. Only enough vegetative growth should be left to replace the old framework of the plant occasionally or expand its size. Winter pruning is useful to

A. arguta *vines at the Gardner Museum in Boston. Peter Del Tredici photo*

remove damaged and tangled vines and to reduce the length of strongly growing shoots.

A. arguta tolerates infertile soils and has no known insect or disease problems (Spangler and Ripparda). Like the kiwifruit, which also tolerates a wide range of soil types, *A. arguta* probably will not tolerate poorly drained soil. The Japanese beetle and golden nematode have been recognized as pests of the kiwifruit but neither seriously reduces plant vigor. I have observed no insect or disease damage on *A. arguta*. Even gypsy moth caterpillars do not feed on the foliage.

Cats can pose an unusual problem for *Actinidia* growers, for they are attracted to the aroma of bruised leaves and roots of the plants. This is especially true of *A. polygama*, and to a lesser degree *A. arguta*. Cats may even dig up small transplants. Many of the chemical constituents of catnip leaves are also in *A. polygama*. In *Narcotic Plants* Entoben says the Chinese use the leaves of *A. polygama*, known as "metatabi," to sedate large cats in zoos. The psychoactive constituents apparently affect humans as well. In China an infusion of table wine and *A. polygama* leaves is prescribed as a sedative.

A. arguta is an excellent fruiting vine for residential and urban plantings. It is a vigorous ornamental, has no pest problems, tolerates neglect, and bears remarkably delectable fruit. It also has good potential as a commercial crop where the kiwifruit cannot be grown. Although high-quality plants are in short supply, a few sources do exist. If *Actinidia* vines are planted more widely, as they deserve to be, the selection of improved fruiting cultivars will follow. At present only a few experimenters in this country are cultivating *Actinidia* species for their fruit. Homeowners and landscape professionals can take part by planting seedlings or propagating existing plants known to fruit well. The effort will be rewarded for many years to come by both the low-maintenance, ornamental foliage and the delicious fall harvests.

Foliage of A. arguta. *Edward Goodell photo.*

Edward Goodell would like to hear from anyone who knows the location of fruiting *Actinidia* vines. Please contact him at the Arnold Arboretum, Jamaica Plain, Massachusetts 02130.

Acknowledgments

I wish to acknowledge the invaluable comments and support of the following reviewers, whose contributions immeasurably upgraded the information: Henry Hartman, Frederick McGourty, Daniel C. Milbocker, V. O. Virkau, and Gregory Williams. Finally, I dedicate this work to Elwyn M. Meader, whose numerous successful introductions of new food plants and generous sharing of information is an enduring inspiration for me.

Resources

Much of the information above derives from the work of the Northern Nut Growers Association and the North American Fruit Explorers. Both of these organizations are dedicated to improving less developed food plants by distributing plant materials and evaluating their performance. Each has an open membership policy and publishes informative journals for anyone interested in taking part in its activities.

North American Fruit Explorers — membership organization dedicated to promoting the growing of all types of fruit- and nut-producing woody plants. Publishes *Pomona* quarterly. Membership information: Ray Walker, Box 711, St. Louis, MO 63188.

Northern Nut Growers Association — organized in 1910 to promote minor fruit and nut culture in northern North America. Publishes a highly informative quarterly and report on the annual meeting. Dues $10.00, payable to: John English, Treasurer, R R 3, Bloomington, IN 61701.

Massachusetts Fruition Program — innovative state program promoting fruit and nut tree growing; $64,000 has been appropriated for plant purchases. For information contact: Massachusetts Fruition Program, Department of Food and Agriculture, Government Center, Boston MA 02022. Telephone (617) 727-6632.

Nurseries

The following is a list of nurseries specializing in tree crops. Many are run as small part-time businesses. Orders should be placed well in advance, because supplies are often limited. Most have catalogs available upon request.

Alexander's Nurseries, Box 309, Middleboro, MA 02346. Seeds and rooted cuttings of selected *Actinidia arguta* vines.

Beaverlodge Nursery, Box 127, Beaverlodge, Alberta, Canada T0H 0C0. Very hardy (zone 2) fruit trees and shrubs, including improved cultivars of juneberry (*Amelanchier* sp.).

Campberry Farms, c/o Mr. R. D. Campbell, R R 1, Niagara-on-the-Lake, Ontario, Canada L0S 1J0. Improved strains of nuts and native fruits including persimmons.

Dave Lawyer Nurseries, Route 2, Box 95, Plains, MT 59859. *Actinidia* seeds and seedlings.

Earl Douglass, Red Creek, NY 13143. Seeds and seedlings of Chinese and American chestnut hybrids.

Farmer's Seed and Nursery, Fairbault, MN 55021. Cold-hardy fruiting selections of rose, juneberry, cranberry, viburnum, elderberry, table grapes, and *Prunus* species.

John H. Gordon, Jr., 1385 Campbell Boulevard, North Tonawanda, NY 14120. Seeds, seedlings, and root stocks of chestnut, hazelnut, northern pecan, walnut, hickory, nut pine, persimmon, mulberry, and oak.

Grimo Nut Nursery, R R 3, Lakeshore Road, Niagara-on-the-Lake, Ontario, Canada L0S 1J0. Good selection of walnut, hickory, nut pine, chestnut, northern pecan, hazelnut, mulberry, and edible-kerneled apricot cultivars and seedlings. Custom propagation available.

Gurney's Seed and Nursery, Yankton, SD 57079. Chestnut and persimmon seedlings as well as a selection of other native and standard fruits and nuts.

Hess Nurseries, Box 326, Route 553, Cedarville, NJ 08311. Primarily landscape plants, also juneberry and pine nut seedlings.

International Tree Crops Institute, Appalachian Regional Office, Route 1, Gravel Switch, KY 40328. *Actinidia arguta* seedlings and chestnut and persimmon seedlings and cultivars.

Jersey Chestnut Farm, 58 Van Duyne Avenue, Wayne, NJ 07470. Selected chestnut seedlings and persimmon cultivars.

Kelly Brothers Nurseries, Dansville, NY 14437. Fruit cultivars and nut seedlings.

Leslie Wilmoth Nursery, Route 2, Box 469, Elizabethtown, KY 42701. High quality seedlings and cultivars of walnut, pecan, chestnut, hickory, hazelnut, and fruit trees. Custom propagation available.

Louis Gerardi Nursery, R R 1, O'Fallon, IL 62269. Seeds, seedlings, and cultivars of a wide range of nut trees; also persimmon and mulberry.

Mellinger's, 2310 West South Range Road, North Lima, OH 44452. Wide variety of food-producing plants.

Miller Nurseries, Canandaigua, NY 14424. Seedling chestnuts and wide selection of fruits.

Nebraska Nut and Fruit Tree Seed Program, Nebraska Nut Growers Association, Box 4644, Lincoln, NE 68504. Seed packets of native nut and fruit trees.

New York State Fruit Testing Cooperative Association, Geneva, NY 14456. New and antique cultivars of all commercial fruits, also elderberry and mulberry cultivars. Catalog available to members, annual dues $5.00.

Ray Guidi Nursery, 193 Curtis Avenue, Dalton, MA 01226. Seedlings of native and hybrid nut trees.

Saginaw Valley Nut Nursery, c/o Richard D. Goldner, M.D., 8252 Dixie Highway, Route 3, Birch Run, MI 48415. Good selection of cultivars and seedlings from the walnut family, adapted to cold winters and short growing seasons.

St. Lawrence Nursery, R D 2 Route 56A, Potsdam, NY 13676. Exceptionally hardy fruits and nuts.

Robert G. Seip, R D 1, Box 683, Alburtis, PA 18011. Hickory, walnut, hazelnut, chestnut, and persimmon cultivars and seedlings.

Southmeadow Fruit Gardens, Grootendorst Nursery, Box SM, Lakeside, MI 49116. Extensive listing of choice antique fruit varieties.

Archie Sparks, Beaver, IA 50031. High quality black walnut cultivars, seeds, and seedlings.

Stark Brothers Nursery, Louisiana, MO 63353. Chestnut and persimmon seedlings and cultivars. Largest supplier of home orchard plants.

Talbott Nursery, R R 3, Box 212, Linton, IN 47441. Persimmon cultivars, and chestnut and walnut seedlings.

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