

Cashew-Apple Fruit Growing in the Florida Home Landscape¹

John McLaughlin, Carlos Balerdi and Jonathan Crane²

Scientific Name: *Anacardium occidentale*

Synonyms: *Acajuba occidentalis*, *Cassuvium pomiferum*

Common names: Maranon, cajuil (Puerto Rico), mereh (Venezuela), caju (Portuguese), acajou (French)

Family: Anacardiaceae

Relatives: mango (*Mangifera indica*), pistachio (*Pistacia vera*), spondias (*Spondias* spp.), varnish tree (*Toxicodendron vernicifera*), tannin (*Schinopsis* spp.), Brazilian pepper (*Schinus terebinthifolius*), poison sumac (*Rhus vernix*), poison wood (*Metopium toxiferum*), and poison ivy (*Toxicodendron radicans*).

Origin: Northeastern Brazil in the region between the Atlantic and Amazon rainforests. This area is a dry forest or savannah-woodland habitat.

Distribution: The cashew is now of pan-tropical distribution, and is grown commercially in many tropical areas of the world including East Africa, Southeast Asia, India and Australia, with India,



Figure 1. Cashew apple and nut.

Vietnam, and Brazil currently the leading producers. Since cashew requires a frost-free tropical climate, planting in the U.S. is limited to extreme southern Florida, Hawaii and Puerto Rico. There is no commercial production in the U.S., though cashews are grown in botanical collections and some home landscapes.

History: Portuguese explorers first took the cashew from Brazil to India (Goa) and then to Mozambique (Africa) in the 16th century. From these two areas the cashew spread to other parts of East Africa and Angola, as well as throughout

1. This document is HS1127, one of a series of the Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date April, 2008. Reviewed March, 2011. Visit the EDIS website at <http://edis.ifas.ufl.edu>.
2. J. McLaughlin, Urban Horticulturist Assistant, Miami-Dade County, Homestead, FL; J. H. Crane, Professor and Tropical Fruit Crops Extension Specialist, Tropical Research and Education Center, Homestead, FL; C.F. Balerdi, Professor and Multi-County Fruit Crops Extension Agent (retired), Miami-Dade County, Homestead, FL; I. Maguire, Media Artist, Tropical Research and Education Center, Homestead, FL; Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

southeastern Asia and northern Australia. It is likely that Spanish explorers spread the plant to Central America and the Caribbean basin. Cashews were first imported to the United States from India in the early part of the 20th century.

Cashew nut is an important item of commerce, however, in the past the cashew apple was of primary interest, not the nut. There are areas of the Caribbean, South and Central America and East Africa, where trees are still grown solely for local cashew apple consumption.

Importance: The major cashew producers are India and Brazil. However, cashew is an important commercial crop in east Africa (e.g., Mozambique, Tanzania, Kenya), southeast Asia (e.g., Vietnam, Indonesia), Central America (e.g., Costa Rica, Guatemala), and some South American countries (e.g., Peru, Venezuela, Colombia).

Caution: Homeowners should not attempt shelling and consuming the cashew *nut* produced by cashew trees grown in the home landscape. The shell contains a reddish-brown, viscous, oily liquid composed of various phenolic lipids. This oil is *poisonous* and acts as a powerful vesicant, causing extensive blistering of the skin (dermatitis). Removal of the kernel from raw nuts requires special precautions and procedures. The sap from the wood, leaves, and flowers may also cause dermatitis and the smoke from burning any part of the tree is poisonous.

Description

Tree

Under ideal tropical conditions the cashew is an attractive, erect, 20- to 35-ft. evergreen tree with smooth brown bark and a dense, symmetrical, spreading canopy. Branching occurs very low on the trunk, with the lowest limbs often touching the ground where they can take root. More usually, where conditions are less than optimal, the tree grows to no more than 15 to 25 ft. and can develop an ill-defined trunk and a spreading, straggly growth habit. There are two main cashew tree-types: Gigante (giant) or Tardio (late), which are large, vigorous trees, usually flowering in their third year from planting, and Anao (dwarf) or Precoce (precocious),

which are smaller trees that begin to bloom and fruit in their second or third year from planting and may bloom more than once per year. Clonal dwarf types or cultivars have been selected for in Brazil and India and are ideal for the smaller yard, but these are not presently available in the U.S.

Where soil conditions permit (e.g. deep sandy loams), the tree develops a pronounced taproot. The oolitic limestone that underlies the thin soils of Miami-Dade precludes substantial development of a taproot. Cashews rapidly develop an extensive system of lateral roots that reach far beyond the edge of the tree canopy.

Leaves

The leaves are green and simple, arranged alternately toward the end of the stems, with a short petiole (stalk). Each leaf is 6 to 7 inches long, obovate to obovate-oblong with a rounded or sometimes notched tip, leathery, smooth and pliable (coriaceous), with prominent veins. There are usually 3 to 14 leaves on each terminal stem. Leaves become fully mature 20 to 25 days after emerging.

Inflorescence (Flowers)

Cashew flowers are borne on 4- to 8-inch terminal panicles bearing 5 to 11 laterals. The panicles consist predominantly of male flowers (~60%) and some bisexual (perfect) flowers (~40%). There are rarely any female flowers. Male and bisexual flowers usually have a single large stamen and 5 to 9 smaller ones.

There may be 200 to 1,600 flowers per panicle. Flowering may occur over a 30- to 60-day period. Individual flowers are sweet-smelling and small with usually five yellowish-green sepals and five pinkish, reddish or whitish petals, each about 0.4 inches long. The petals turn pink and become recurved as the flower fully opens. The terminal flowers open before the lateral flowers. On opening, flowers are receptive to pollen for several days. The stigma is immediately receptive; however release of pollen occurs later, favoring cross-pollination.

Fruit

The true fruit is a kidney-shaped nut consisting of a double-walled shell (an outer, thick exocarp and an inner, hard endocarp separated by a resinous, cellular mesocarp), surrounding an edible kernel: the cashew nut of commerce. The nut is pink at first, changes to green, then becomes a greenish grey then grayish brown as it develops. As the nut approaches maturity, the stalk (or, more accurately, receptacle) above it becomes swollen and fleshy, forming the 2- to 4-inch, yellow and/or red, juicy, pear-shaped accessory fruit known as the cashew apple.

Great care must be exercised in handling raw nuts, since the shell contains a poisonous, thick, caustic oil, which can cause severe dermatitis in susceptible individuals. Gloves should be worn when removing the cashew nut from the cashew apple. Note that cashew is in the same family as Brazilian pepper and poison ivy, both well known as capable of inducing severe allergic reactions.

Flowering and Pollination:

Cashew flowering is always preceded by new leaf and shoot growth (i.e., cashew flowers on the current season's shoot growth). Cashew trees commonly flower during the spring in south Florida. However, trees may flower after prolonged dry periods. In more tropical climates that are wet on and off throughout the year, flowering can occur at any time. Although the bisexual flowers are self fertile, they require cross pollination. Cashew flowers appear to be both insect- and wind-pollinated; it is not known which pollination method is more important under south Florida conditions. Flowers open between 8:00 AM and 2:00 PM; cool temperatures may delay flower opening. About 70% of the bisexual flowers fail to set fruit, resulting in only 1 to 6 fruit per panicle. The overall fruit set of seedling trees generally ranges from 3 to 12%. However, cashew flowers can be hand pollinated to increase fruit set. The time from flowering to cashew nut maturity is about 50 to 60 days and it takes another 20 to 30 days for the cashew apple to mature depending upon ambient temperatures.

Varieties

In countries where cashew is grown commercially, different varieties and or seedlings are grown. In south Florida, few if any named cultivars are available and seedlings or air-layers of seedling material are grown. There may be marked variation in shape, color, and size of the cashew apple from different seedling cashew trees.

Climate

Cashew is best adapted to seasonally dry tropical climates, with optimum growth occurring at temperatures from 63°F to 100°F and a relative humidity of 65-80%. Trees are drought tolerant but production is improved if sufficient soil moisture is provided (either rainfall or irrigation) during fruit set and development. The tree will not tolerate even short exposures to frost (freezing temperatures). Annual rainfall between 27 to 78 inches is optimal, though trees will survive with as little as 2 to 15 inches of rain. More important than the amount of rain is its distribution throughout the year. Under irrigated conditions the best quality cashews are produced during dry periods. This is because frequent rainfall during flowering and fruit development may result in severe fruit disease problems. However, watering trees without getting the foliage, flowers, and fruit wet is beneficial to fruit development and production.

Propagation

Finding viable cashew seed may be problem. If viable seed is available, this is the easiest method of propagation; the seed is obtained by separating the nut from the ripened cashew apple. Because of the toxic compounds associated with the shell of the nut, gloves should be worn when removing the nut (seed). The unshelled nuts (seed) are dropped in a bucket of water and left for 5 to 10 minutes; those that float are discarded. Seeds that sink can either be planted immediately, or sun dried for storage. Dried seed should be placed in an airtight container with wood shavings, for storage in a cool dry place. Stored seed should be used within 7 to 12 months and soaked in water for 24 hours before planting.

Seed propagation is most successful during the part of the year when soil temperatures are warmest. It is usual to sow seeds directly in the ground during summer since seedling trees are difficult to transplant without damaging the brittle roots. Seeds should be planted about 2 inches deep; use 3 to 4 seeds and expect germination after 2 to 4 weeks. Allow the seedlings to grow until they are about 6 inches tall, then select the most vigorous plant and remove the other two. If containers are used, choose those that are biodegradable, such as peat pots. After the seeds germinate, remove the weakest two seedlings and allow the remaining plant to grow to about 12 inches tall, then place the entire peat pot containing the seedling tree into a 3-gallon container. When the plant grows to about 3 to 4 feet, it may be planted in the ground. Growing young seedlings under light shade may facilitate early plant growth and establishment. Trees should be planted in full sun.

To increase the success of planting young trees purchased from a nursery, prune off 1/4 to 1/2 of the tree canopy. This will reduce the potential water demand by the top of the plant, reduce planting shock, and facilitate plant survival.

Since seed-grown plants do not come true to type, vegetative means are required to propagate superior varieties, with air layering being the preferred method. Air-layers are most successful during summer and peak shoot and leaf growth. Removing some leaves a week in advance of severing the air-layer from the tree increases the chances that it will survive once placed in a container to develop a more extensive root system. Stem cuttings can be used to propagate cashew; however it is important to use a light, well aerated growing medium, and to provide shade from direct sun and continuous high humidity (e.g. misting). Best results are obtained when semi-mature wood is used. Though this method is not as common, trees can also be patch- or shield-budded and side- or veneer-grafted. Budding and grafting should be done immediately prior to sprouting of new buds.

Production (Crop Yields)

Seedling trees usually begin fruit production after 3 to 4 years. Wet weather during flowering and

fruit set will severely reduce yields, and under Miami-Dade conditions it may be desirable to adopt a spray program to protect the flowers and fruit from fungal attack. The time from flowering to cashew apple harvest is usually 2.5 to 3 months depending upon temperatures. Cashew apples become sweeter if they are allowed to ripen on the tree after they mature. However, tree-ripened fruit can fall to the ground, at which time it rapidly spoils within a day or two. For this reason it is advisable to remove fruit by hand at as a ripe a stage as possible, where trees are being grown for the cashew apple.

Canopy exposure to full sunlight is required for optimum and reliable flowering. The yield of a given tree is a function of the number of bisexual flowers produced. It is important for backyard growers to remember that since most of the flowers produced are male, the yield of fruit may appear far less than expected compared to the amount of bloom.

In countries where trees are grown commercially, cultivars are being developed with increased numbers of bisexual flowers. As with other fruit trees, it is quite common for some of the developing fruit to drop from a cashew tree before it is ready to harvest. A mature tree is capable of producing about 50-75 lbs of fruit (cashew apple plus nut).

Spacing

Cashew trees in the home landscape should be planted 15 to 20 feet or more (4.6 to 6.1 m) away from buildings, electrical wires, or other trees.

Soils

Cashew trees are well adapted to many well-drained soil types and trees growing in light sand and limestone soils produce satisfactory yields. However, cashews grow best on deep, well-drained, sandy soils with a pH of 4.5 to 6.5, whereas trees growing in the limestone-based soils (pH 7.4-8.5) of Miami-Dade County may develop nutrient deficiencies of iron, zinc, and manganese. Cashew trees are moderately tolerant of occasional flooding and can withstand excessively moist soils for brief periods, but will fail to thrive on poorly drained soils.

Planting a Cashew Tree

Proper planting is one of the most important steps in successfully establishing and growing a strong, productive tree. The first step is to choose a healthy nursery tree. Commonly, nursery cashew trees are grown in 3-gallon (11-liter) containers, and trees stand 2 to 4 ft (0.6-0.9 m) from the surface of the soil media. Large trees in smaller containers should be avoided because the root system may be "root bound." This means all the available space in the container has been filled with roots to the point that the tap root is growing along the edge of the container in a circular fashion. Root-bound root systems may not grow properly once planted in the ground. Inspect the tree for insect pests and diseases and inspect the trunk of the tree for wounds and constrictions. Select a healthy tree and water it regularly in preparation for planting.

Seedling and air-layered cashew trees have a fragile root system and careful handling during planting will decrease the chances of transplant shock. One method for minimizing root damage is to remove the bottom of the container prior to setting it in the planting hole. The plant is then placed in the planting hole by supporting the base of the plant and then soil is placed halfway up the container sides. The bottomless container can then be pulled up, cut open at the side and removed from the plant. Then the remainder of soil backfill is completed. This helps to keep the root ball intact as it is placed in the planting hole

Site Selection

In general, cashew trees should be planted in full sun for best growth and fruit production. Select a part of the landscape away from other trees, buildings and structures, and power lines. Remember cashew trees can become moderately large if not pruned to contain their size. Select the warmest area of the landscape that does not flood (or remain wet) after typical summer rains. In the home landscape, select an area that is not prone to flooding. If there is a potential for flooding, plant the tree on a large hill or mound made up of native soil, 2 to 3 ft high (0.6 to 0.9 m) by 4 to 6 ft diameter (1.2 to 1.8 m).

Cashew tree planting is best during the warmest part of year (May through August), which corresponds with the rainy season. Warm, wet weather conditions during planting will enhance plant establishment and allow the young tree to withstand the cooler and dryer fall and winter months.

Planting in Sandy Soil

Many areas in Florida have sandy soil. Remove a 3- to 10-ft-diameter (0.9- to 3.1-m) ring of grass sod. Dig a hole 3 to 4 times the diameter and 3 times as deep as the container the cashew tree came in. Making a large hole loosens the soil next to the new tree, making it easy for the roots to expand into the adjacent soil. It is not necessary to apply fertilizer, topsoil, or compost to the hole. In fact, placing topsoil or compost in the hole first and then planting on top of it is not desirable. If you wish to add topsoil or compost to the native soil, mix it with the excavated soil in no more than a 1:1 ratio. Backfill the hole with some of the excavated soil. Cashew seedlings are very sensitive to transplanting injury; therefore, trees should be handled carefully when placing the root ball into the planting hole. Remove the tree from the container and place it in the hole so that the top of the soil media from the container is level with or slightly above the surrounding soil level. Fill soil in around the tree roots and tamp slightly to remove air pockets. Immediately water the soil around the tree and tree roots. Staking the tree with a wooden or bamboo stake is optional. However, do not use wire or nylon rope to tie the tree to the stake because they may eventually damage the tree trunk as it grows. Use a cotton or natural fiber string that will degrade slowly. Removing 1/4 to 1/2 of the canopy (top) of the tree increases survival of newly planted cashew trees.

Planting in Rockland Soil

Many areas in Miami-Dade County have a very shallow soil, and several inches below the soil surface is a hard, calcareous bedrock. Remove a 3- to 10-ft-diameter (0.9- to 3.1-m) ring of grass sod. Make a hole 3 to 4 times the diameter and 3 times as deep as the container the cashew tree came in. To dig a hole, use a pick and digging bar to break up the rock, or contract with a company that has augering

equipment or a backhoe. Plant as described in the section above.

Planting on a Mound

Many areas in Florida are within 7 feet or so of the water table and experience occasional flooding after heavy rains. To improve plant survival, consider planting fruit trees on a 3- to 4-ft-high by 4- to 10-ft-diameter (0.6- to 0.9-m by 1.2- to 3.1-m) mound of native soil. After the mound is made, dig a hole 3 to 4 times the diameter and 3 times as deep as the container the tree came in. In areas where the bedrock nearly comes to the surface (rockland soil), follow the recommendations for the previous section. In areas with sandy soil, follow the recommendations from the section on planting in sandy soil.

Care of Cashew Trees in the Home Landscape

To promote growth and regular fruiting, mature cashew trees should be periodically fertilized and watered. Insects and diseases should be controlled only as needed (Table 2). A calendar outlining the suggested month-to-month cultural practices for cashew is shown in (Table 1).

Fertilizer

Cashews respond well to fertilizer, but there are no specific recommendations for south Florida, and the following are suggested based on experience with related fruit trees grown in south Florida (Table 2).

In Florida, young trees should receive fertilizer applications every month during the first year, beginning with 1/4 lb (114 g) and gradually increasing to one pound (455 g). Thereafter, 3 to 4 applications per year in amounts proportionate to the increasing size of the tree are sufficient (Table 3). Fertilizer mixtures containing 6 to 10% nitrogen, 6 to 10% available phosphoric acid, 6 to 10% potash, and 4 to 6% magnesium give satisfactory results with young trees. For bearing trees, potash should be increased to 9 to 15% and available phosphoric acid reduced to 2 to 4%. Examples of commonly available fertilizer mixes include 6-6-6-2 and 8-3-9-2.

Cashew trees growing in calcareous soils should receive annual nutritional sprays of copper, zinc, manganese, and boron. Boron should only be applied at very low rates (1/300th of the nitrogen rate) because above this it becomes toxic to plants. Mixes containing copper, zinc, manganese, and boron are available from many garden centers. Iron should be applied in chelated form (FeEDDHA compounds are the best) as a soil drench 2 to 3 times per year.

Cashew trees growing in neutral and acid pH soils may be fertilized with soil-applied dry materials of iron, zinc, boron, and manganese, either separately or in mixes. Copper should be applied as a nutritional spray and boron only as needed. Iron may be applied in chelated compounds (FeEDTA instead of FeEDDHA), as a soil drench, or in non-chelated form as a dry material that is watered in 2 to 3 times per year.

Irrigation (Watering)

Newly planted cashew trees should be watered at planting and every other day for the first 7 to 10 days and then 1 to 2 times a week for the first couple of months. During prolonged hot, dry periods (e.g., 5 or more days of little to no rainfall) newly planted and young cashew trees (first 3 years) should be watered once a week. Once the rainy season arrives, irrigation frequency may be reduced or stopped.

Once cashew trees are 4 or more years old, irrigation will be beneficial to plant growth and crop yields only during very prolonged dry periods during spring and summer. Mature cashew trees do not need frequent watering, and over watering may cause trees to decline or be unthrifty. Little to no irrigation is generally necessary during the fall and winter.

Cashew Trees and Lawn Care

Cashew trees in the home landscape are susceptible to trunk injury caused by lawn mowers and weed eaters. Maintain a grass-free area 2 to 5 or more feet away from the trunk of the tree. Never hit the tree trunk with lawn mowing equipment and never use a weed eater near the tree trunk. Mechanical damage to the tree trunk will weaken it, and if the damage is severe enough, it can cause dieback or kill the tree.

Roots of mature cashew trees spread beyond the drip-line of the tree canopy and heavy fertilization of the lawn next to cashew trees is not recommended because it may reduce fruiting and or fruit quality. The use of lawn sprinkler systems on a timer may result in over watering and cause cashew trees to decline. This is because too much water too often applied causes root rot. Maintain a circular 4- to 6-ft. area around the trunk free of lawn grass, and remove weeds as they appear. Do not use products containing the herbicide atrazine (e.g., weed and feed products) to control weeds in the lawn near cashew trees. Atrazine is toxic to cashew trees.

Mulch

Mulching cashew trees in the home landscape helps retain soil moisture, reduces weed problems next to the tree trunk, and improves the soil near the surface. Mulch around the base of the tree with a 2- to 4-inch (5- to 10-cm) layer of bark, wood chips, or similar mulch material. Keep mulch 8 to 12 inches (20-30 cm) from the trunk.

Insect Pests

There is no specific information on pest problems of cashew in south Florida. In those areas of the tropics where there is extensive experience growing cashew, important pests have included various insect borers (larval stages of beetles and moths), insects that destroy flowers or foliage (beetles, caterpillars, thrips and mirids) and those that attack fruit (plant bugs, beetles and caterpillars). Periodically monitor the tree for pests. For more information and control measures, consult your county agricultural agent.

Diseases

Disease control for cashew trees in the home landscape may not be warranted and should not be intensive. The easiest method for avoiding disease problems is to plant trees in full sun, where the flowers, leaves, and fruit dry off quickly after rainfall; not to apply irrigation water to the foliage, flowers, and fruit; and to monitor the tree for disease problems during the flowering and fruiting season.

The two major disease problems for cashew trees in the home landscape are powdery mildew and anthracnose. Both these fungal pathogens attack newly emerging panicles, flowers, and young fruit. One to two early spring applications of sulfur plus a copper-based fungicide timed to begin when the panicle is 1/2 full size and then 10 to 21 days later will greatly improve the chances for fruit set and production.

Successful chemical control of diseases caused by fungi requires that all susceptible parts of the plant be thoroughly coated with the fungicide before infection occurs. Sprays applied after infection (which occurs from several days to months before the disease is evident) will not stop disease development. Sprays must be re-applied as new tissues become exposed by growth and as spray residues are reduced by weathering. A successful program depends on use of the right amount of a recommended fungicide, timely applications before infection is most likely to occur, and thorough coverage of susceptible plant parts.

Anthracnose (*Colletotrichum gloeosporioides*):

The most important disease of cashew in Florida, the anthracnose algae, attacks flowers, young fruits, leaves and twigs. It also appears as a storage disease of mature fruits. Symptoms may appear as black or reddish-brown, slightly sunken lesions of irregular shape, which gradually enlarge and cause blossom blight, leaf spotting, fruit staining, and fruit rot. Disease development is encouraged by rains or heavy dews. Prevention can be accomplished by maintaining a coating of copper fungicide on susceptible parts starting when bloom buds begin to expand and ending at fruit set. Fungicide applications during dry weather conditions are not needed.

Powdery Mildew (*Oidium* sp.): The fungus attacks leaves, flowers and young fruits during the dry spring weather. Infected tissues are covered with the whitish, powdery growth of the fungus. Lesions develop along the midribs or undersides of leaves and become dark brown and greasy-looking as leaves mature. Severe infections destroy flowering panicles and cause failure of fruit set and defoliation of trees. Prevention can be accomplished by maintaining a coating of sulfur fungicide on the flowers beginning

when bloom buds begin to expand and ending at fruit set.

Alga Spot (*Cephaleuros* sp.): This parasitic alga attacks leaves and stems. Symptoms begin as circular green-gray spots which then turn rust red, indicating sporulation. Stem infection appears similar but can lead to bark cankers and thickening and stem death. This organism is normally not a problem where copper fungicides are periodically applied during the summer months.

Phytophthora Root Rot (*Phytophthora* sp.): The fungus attacks the roots, causing nutrient deficiencies (chlorosis), wilting, leaf drop, stem dieback and tree death. Cashew trees should not be planted in poorly drained soils or areas subject to flooding.

Pruning

Formative pruning during the first 2 years may be desirable to encourage lateral branching and growth. Remove 1-2 inches from all shoot tips during spring and summer for the first two years after planting. Tip pruning stems stimulates them to put out new growth and promotes the development of a more compact, well-structured tree. After several years of production, it is desirable to cut back the tops of the trees to 10 to 12 feet (3.1 to 3.7 m). Selective removal of a few upper limbs back to their origins (crotches) each year will reduce the work and time needed to spray the tree and harvest the fruit, help prevent the loss of the lower tree canopy, and greatly reduce possible storm damage. Pruning should be done soon after harvest.

If cashew trees are allowed to become 30 ft or more feet tall (9.1 m) extreme caution should be used in pruning cashew trees. Climbing trees to prune them is dangerous and not recommended. Pruning of large cashew trees should be done by a professional arborist who is licensed and insured.

Harvest, Ripening, and Storage

Cashew apples may be harvested from the tree when they are fully mature (fruit have turned from green to yellow or red) or after they drop to the ground. Mature cashew apples harvested from the

tree ripen rapidly at room temperature and should be allowed to ripen before they are put in the refrigerator. Cashew apples harvested from the ground should be consumed, refrigerated or processed immediately. Once the cashew apple is ripe, store it in a polyethylene storage bag in the refrigerator.

Uses and Nutritional Value

Homeowners *should not* attempt to shell or consume the cashew nut produced by cashew trees grown in the home landscape. The shell contains a reddish-brown, viscous, oily liquid composed of various phenolic lipids. This oil is *poisonous* and acts as a powerful vesicant, causing extensive blistering of the skin. Removal of the kernel from raw nuts requires special precautions and procedures. Commercially, special equipment and roasting is used to remove most of these oils before shelling, thereby preventing contamination of the nut as it is processed. This should *not* be attempted at home, and certainly never indoors, because the oil is volatile and could cause severe lung damage. Even with commercially prepared cashew nuts there have been a few instances of dermatitis where fragments of shell remained in the packaged nuts.

The cashew apple may be consumed directly or either used for juice or preserved in syrup (candied). The fresh cashew apples from non-improved plant material may be astringent due to their high tannin content, and are much more palatable if first processed to remove the bitter taste. This can be accomplished either by steaming under pressure (i.e. a pressure cooker) for 10-15 minutes, or boiling in salty water for 15 minutes. The apples are then pressed to remove excess moisture and boiled in cane sugar syrup for 2 hours. Finally they are sun dried, or placed in an electric food drier. Cashew apples are also canned in syrup and used to prepare chutneys and fruit pastes. Because of their high pectin content, they set readily and make good jam.

The juice can also be extracted and strained, after which gelatin is added at a rate of 1/4 oz per 3 cups of strained juice with constant stirring for 15 minutes. The tannins in the juice bind to the gelatin and form a precipitate, which can then be removed by filtering through muslin cloth. Sugar can then be added to

taste. The juice readily ferments, and is used in various countries to prepare wines and distilled liquors (e.g. Brazil, Guatemala, Western Africa, India, Sri Lanka and the Philippines). Take care when handling the juice since it can permanently stain clothing. Cashew apples are a good source of Vitamin C (Table 3).

References

- Anacardium occidentale* ICRAF Agroforestry Tree Data Base
http://www.worldagroforestry.org/treedb2/AFTPDFS/Anacardium_occidentale.pdf
- Alves-Costa, J.T. 1974. The cashew: origin, synonymy, taxonomy, and morphology. Hort. Sci. student report (nonpublished). P. 1-23.
- Davis, K 1999. Cashew. ECHO Technical Note
<http://www.echotech.org/repositories#17:d:Cashew.pdf>
- Jernberg, D.C. 1974. Survey of the morphology of cashew. Hort. Sci. student report (nonpublished). P. 1-17.
- Madhava, V.N. and M.V. Hassan. 1957. Preliminary studies on the floral biology of cashew (*Anacardium occidentale* Linn). The Indian J. of Agri. Sciences 27:277-288.
- Nambiar, M.C. 1977. Cashew. In: Ecophysiology of fruit crops. (Alvins, P. de T. and Kozlovsky, T.T., eds.). Academic Press, New York, pp. 461-477.
- Montealegre, J.C., N.F. Childers, S.A. Sargent, L.M. Barros, and R.E. Alves. 1999. Cashew (*Anacardium occidentale*, L.) nut and apple: a review of current production and handling recommendations. Fruit and Nut J. 53:2-9.
- Morton, J.F. 1987. Cashew apple. In: Fruits of warm climates. J.F. Morton, Publ., Miami, Fla. p. 239-240.
- van Eijnatten, C.L.M. 1991. *Anacardium occidentale*. In: Plant resources of South-East Asia: edible fruits and nuts, no. 2. (E.W.M. Verheij and R.E. Coronel, editors). Pudoc-DLO, Wageningen, the Netherlands. p. 60-64.

Table 1. Cultural calendar for cashew production of mature (bearing) trees in the home landscape.

Operation	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Dry fertilizer ¹			The period from March through August is generally the best time to apply granular mixes containing nitrogen-phosphate-potash-magnesium (N-P-K-Mg).									
Nutritional sprays			Apply 2 to 4 nutritional sprays to leaves any time from March through September. Nutritional sprays should contain magnesium, manganese, zinc, boron, and molybdenum.									
Iron soil drenches			The period from April through September is generally the best time to apply 2 to 4 soil drenches of chelated iron material to calcareous soils and 2 to 4 applications of iron sulfate to low-pH sandy soil.									
Watering	In general, mature cashew trees do not require watering unless exposed to intense, prolonged drought. Over watering may lead to unthrifty trees. When watering, avoid wetting blossoms or fruit: otherwise both will be placed at increased risk from fungal diseases.											
Insect control	Monitor for infestations of beetles, caterpillars, thrips and mirids. For more information and control measures, consult your county agricultural agent.											
Disease control	Prevent powdery mildew and anthracnose disease of emerging flowers and young fruit with timely fungicide applications. For more information and control measures, consult your county agricultural agent.											
Pruning								Pruning to reduce or maintain trees at or below 12 ft after harvest.				

¹ Dry fertilizer mix which includes nitrogen, phosphorus, potassium and magnesium.

Table 2. Fertilizer program for cashew trees in the home landscape.

Year	Times per year	Amount/tree/year (lbs) ¹	Total amount/tree/year (lbs) ¹	Minor element sprays (times/year) ²	Iron chelate drenches (oz/tree/year) ³
1	6	0.25-0.5	1.5-3.0	6	0.5-0.75
2	6	0.5-1.0	3.0-6.0	6	0.75-1.0
3	6	1.0-1.5	6.0-9.0	6	1.0-1.5
4	4	1.25-2.5	9.0-10.0	6	1.5-2.0
5	4	2.5-3.5	10.0-14.0	4	2-4
6	4	3.5-4.0	14.0-16.0	4	2-4
7	4	4.0-4.5	16.0-18.0	4	2-4
8+	4	4.5-5.0	18.0-20.0	4	2-4

¹ For young trees, use an NPK Mg mix of 6-6-6-2, 8-3-9-2, or a young-tree or slow-release fertilizer. For mature trees, use an N-P-K-Mg mix of 6-6-6-2, 8-3-9-2, or similar material.

² The foliar spray should contain zinc, manganese, boron, and molybdenum; it may also contain magnesium and iron.

³ Iron chelate soil drenches (iron plus water) will prevent iron deficiency; foliar sprays of iron materials are generally not effective.

Table 3. Nutrient value of cashew apple fruit (3.5 oz or 100 g of fruit).¹

Constituent	Approximate value
Water content	84-88%
Protein	0.1-0.16 g
Fat	0.05-0.5 g
Carbohydrate	9.1-9.8
Total dietary fiber	0.4-1.0 g
Calcium	0.9-5.4 mg
Iron	0.2-0.7 mg
Thiamine	0.02-0.03
Riboflavin	0.1-0.4
Niacin	0.1-0.5 mg
Vitamin C (ascorbic acid)	147-372 mg

¹ Morton, J. 1987. Cashew Apple. In: Fruits of warm climates. Julia F. Morton Publ., Miami, FL. p. 239-240.