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University of Florida
SUB-TROPICAL EXPERIMENT STATION
Homestead, FloridaTHE WEST INDIAN OR BARBADOS CHERRY
by
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The West Indian cherry is a shrub or small tree that has been grown in South and Central Florida for many years, mainly as a backyard fruit plant. It is valued for its fruits which have a characteristic flavor and which are usually eaten out-of-hand. In recent years this plant has received considerable attention as a result of the discovery of the extremely high vitamin C content of the fruit.

Common Names. In Florida it is known as the West Indian cherry or Barbados cherry. In Puerto Rico it is called Acerola and in Cuba and other Latin American countries it is known as Cereza. Cereza is a Spanish name for cherry, and Acerola is a Spanish name originally used for the fruit of the Hawthorn.

Scientific Names. Malpighia glabra (mal-pig-i-a glā-brā) is the name used most commonly in Florida, but in Puerto Rico it is called Malpighia puniceifolia. The correct scientific name is in doubt at the present time and it is not certain whether there are two species or one species representing several different forms.

Botanical Relationship. The West Indian cherry belongs to the family Malpighiaceae. Other plants included in this family that are cultivated in Florida are the following: Thryallis glauca (synonym Calphimia glauca), a popular ornamental shrub with yellow flowers; Malpighia coccigera, a low growing ornamental shrub with prickly leaves and pinkish flowers; several species of Stigmaphyllon which are vines with attractive yellow flowers; Heptage benghalensis, a climbing shrub with white or pink flowers; and Byrsonima crassifolia, a tree native to Central America with attractive yellow flowers and somewhat edible fruit. One species, Byrsonima lucidum, is a shrub that is native to South Florida and the Keys.

There are several forms of Malpighia which are grown in Florida. Probably all are M. glabra, but they can be divided into two groups: 1) those which have large edible fruit and large leaves; and 2) those with small, inedible fruit and small leaves. The latter are grown as ornamental shrubs throughout peninsular Florida and should not be confused with the true West Indian cherry. These ornamental forms have fruits up to 3/8 inch in diameter, usually bright red in color, and rather dry and insipid. The plant usually remains shrubby and has very attractive flowers. Several introductions of the small fruited forms have been made from various Latin American countries and often they are offered for sale as Malpighia species, but sometimes as M. glabra and even M. puniceifolia.

The West Indian cherry should not be confused with the true cherry, Prunus avium, a member of the Rose family which is grown in temperate climates and not in Florida. Nor should the West Indian cherry be confused with the Surinam cherry, Eugenia uniflora, a member of the Myrtle family. The Surinam cherry is grown throughout most of Florida and is a popular shrub for yard planting, especially for hedges. Superficially the West Indian cherry does resemble the fruit of both of the plants mentioned above, but its structure and flavor are quite different. The true cherry is smooth and not lobed; the Surinam cherry is usually nine-ridged or fluted.

Native Countries. *Malpighia glabra* is native to southern Texas, all of the Central American countries, northern South America to Peru and Dutch Surinam, and all of the West Indian Islands from Trinidad to Cuba.

History. The natives of these countries have undoubtedly eaten the fruit of this shrub for many centuries. The early Spanish explorers observed the native use of this fruit and because they thought it resembled the true cherry which they grew in Spain, they named it "Cereza". The name "Barbados cherry" appears to have been originated by Hans Sloan in 1725 when this plant was described as growing in many gardens in Jamaica. It was probably introduced into Florida from Havana, Cuba, sometime in the 1880's by Pliny Reasoner, for it is listed in his Royal Palm Nursery catalogue for 1887-88, but it was not recognized as an edible fruit until 1903. It has been grown in South and Central Florida as a backyard fruit plant ever since.

DESCRIPTION

The West Indian cherry is a shrub or sometimes a small tree if pruned to develop a central trunk. In 15 years the plant will become about 15 feet high with numerous branches, some growing more or less erect and rather open, but in some seedlings they are thick and spreading. Sometimes plants will tend to sucker from the base, but this can be discouraged by pruning. The leaves vary in size and shape, even on the same plant. Those produced on short spur-like branches are small and crowded. New leaves on young shoots are much larger and possess appressed hairs which sometimes irritate the skin. As the leaves mature, these hairs disappear. The flowers are $\frac{1}{2}$ inch or more across, the color varying in different seedlings; some are pink, red, or rose, others are white. They appear in April along with the new vegetative growth and continue to appear off and on through the summer and fall, often as late as November. They attract bees in large numbers.

The fruit, botanically, is a type of berry-like drupe. It is globular but usually wider than long, shallowly 3-lobed, of various shades of light orange-red to deep purple-red in color. The skin is very thin and delicate and easily bruised. There are three winged and pitted stones, each of which contain one seed, that make up about 15 to 25 percent of the fruit. The average size of the fruit is about 1 inch in diameter and the average weight is about $\frac{1}{3}$ ounce. The largest fruit, however, will become $1\frac{1}{4}$ inches in diameter and weigh over $\frac{1}{2}$ ounce. The fruit resembles the northern crab apple in taste, because of the presence of malic acid, but it has a flavor all its own. Some clones are quite tart and acid; others are less acid and some can be called sweet. The juice that can be extracted from the fruit is about 60 to 70 percent by weight (less than 60 percent in the green fruit), but the total liquids present in the fruit would average 80 percent or higher.

The fruit will mature in 3 to 4 weeks from flowering. Some clones flower and fruit from April to November almost continuously. But usually there are peaks of heavy flowering followed by heavy fruiting, in some clones only 3 or 4, in others, 8 or 10. The fruit size is dependent on adequate rainfall or irrigation and fertilizing practices.

YIELDS AND HARVESTING

The amount of fruit produced varies in the different seedlings as well as with cultural practices. Some clones produce more heavily than others. The highest yield so far obtained at the Sub-Tropical Experiment Station was in 1954 from plants 5 years in the field. An average of 21 pounds of fruit per plant was harvested from a Sweet selection; this amounts to 5,880 pounds of fruit per acre, or nearly 3 tons of fruit. The fruiting season extends for 3 to 7 months, depending on the clone. The fruit must be picked every other day during the peak producing periods. The fruit

can be picked just as it is beginning to turn pink or red. Completely ripe fruits will spoil quickly and should be utilized as soon as possible after harvesting. The ripe fruit is extremely perishable and cannot be shipped. The half-ripe fruit, however, will usually hold up well for several days, especially under refrigeration.

ASCORBIC ACID OR VITAMIN C CONTENT

In 1946 Asenjo and Guzmán in Puerto Rico reported that they found the fruits possessed extremely high amounts of ascorbic acid; the content varied from 1,030 to 3,309 milligrams per 100 grams of edible matter, or 1 to 3 grams of this vitamin in 100 grams (approximately 3½ ounces) of juice. The green fruits were the highest, the fully ripe fruits the lowest in ascorbic acid content. Mustard in Florida in 1946 also reported on the high ascorbic acid content of the West Indian cherry; she found 1,028 to 4,676 mg. per 100 g. edible matter. Here again the green fruits were the highest. She also found 509 to 673 mg. per 100 g. ascorbic acid in jellies, a surprising amount since cooking tends to destroy vitamin C.

The vitamin C content of the fruit has been found to vary with the clone; some seedlings produce fruit with more ascorbic acid than others. But to date all the selections that have been tested and are known to be the true West Indian cherry have all shown relatively high amounts, varying from 1,000 to over 4,000 mg. per 100 g. The vitamin content also varies with the ripeness of the fruit--the green fruit has more ascorbic acid, the pink-green or half-ripe fruit and the red-ripe fruit are mostly the same. The time of the year also affects the concentration of the vitamin--more ascorbic acid is present in the fruit in July than in May.

The daily requirement for an average adult under average conditions is 75 mg. of ascorbic acid (minimum 20-25, adequate 40-45, optimum 75-80). A fruit with more than 60 mg. per 100 g. of ascorbic acid is considered an excellent source of this vitamin. Most fruits are more or less a fair source of ascorbic acid, but the West Indian cherry is superior to practically all other fruits in this respect.

The West Indian cherry is also considered a fair source of vitamin A, containing 1,010 I.U. per 100 g. edible fruit (the daily requirement is 5,000 I.U.). The fruit also contains thiamine, riboflavin, and niacin; these vitamins are present in low amounts and do not differ appreciably from any other fruits. The fruit is a good source of calcium and iron, but contains only small amounts of phosphorus.

CULTURE

Propagation. The West Indian cherry can be propagated by air layers and by cuttings. Air layering is done by the usual method of girdling the stem and removing a ring of bark and then covering this girdle with damp sphagnum moss and a sheet of plastic vinyl film. Rooting in the moss should take place in 4 to 6 weeks. The best method for making cuttings has not been determined. It is suggested that leafy hardwood cuttings be used, varying from 4 to 10 inches in length and 1/8 to 3/8 inch in diameter, with two or three leaves on the upper portion of the stem. The rooting medium should be light and porous (vermiculite, peat moss or sand, or mixtures of two of these materials is suggested) and the cuttings should be kept in a very moist or humid atmosphere. A rooting hormone can be used to hasten the rooting process. Roots should form within two months.

Seeds germinate readily, but some plants produce fruits in which many of the seeds contain non-viable embryos; the percentage of germination of these seeds will frequently be less than 50 percent. In preparing for planting, it is not necessary to remove the seed from the stone; the seed is quite delicate and easily damaged if one

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does try to remove it. The stones are cleaned of all flesh and dried before planting. Dusting the stones with a seed protectant will aid in preventing damping-off of the seedlings.

One year old plants, either from seed, cuttings, or air layers, can be set in the field. In a year's time, the cuttings and air layers will develop a good root system in the containers and the seedlings will be about 1 to 2 feet high. The plants can be set out at any time of the year, but April to June just before the rainy season in Florida is best. Plants will sometimes flower and fruit the second year, but they will not be bearing heavily until the third or fourth year.

Soil. The plants have grown well in the alkaline rockland of South Dade County and have also done well in the acid sands of Central Florida provided root-knot is not much of a problem. The West Indian cherry should not be planted in any area that is subjected to flooding for the plants will be killed if stagnant water stands over the roots for periods of more than a few days at a time.

Planting. The plants should be set 12 to 15 feet apart both ways, or 12 feet apart in the rows and 15 feet between the rows. In this way 280 plants can be set out in one acre. The West Indian cherry can be planted as a hedge, setting the plants about 2 feet apart. In 5 to 7 years they will make thick growth and be about 12 feet high.

Fertilizing. The plants are dormant in the winter months, from December to March. With the onset of warm weather in March and April, vegetative growth begins and flowering takes place shortly after on the new growth. At the Sub-Tropical Experiment Station good results have been obtained by fertilizing with a 10-0-10 mixture in early March just before the new growth emerges. This fertilizer mixture will encourage good growth and flowering. About $\frac{1}{2}$ pound per tree 3 to 4 years old is sufficient. In May, July and September a 4-7-5-3 mixture, or a 6-4-6-3 for older plants that have been fertilized for several years is used. One half pound to 1 pound of fertilizer per plant, depending on the size and age of the plant, is sufficient, and it is broadcast on the ground from near the central trunk to 1 or 2 feet beyond the leaves.

Irrigation. An adequate supply of water is very beneficial in promoting good growth and maximum yields of large fruit. Rainfall is usually sufficient during the summer and fall months, but irrigation is needed during dry spring months. The fruits produced during this period are often small and shriveled because of lack of sufficient water. Irrigation at this time should be at least twice a week. It is not necessary to irrigate when the plants are dormant.

Pruning. All plants, when they become several years old, benefit from annual pruning which encourages greater yields. Some seedlings produce numerous branches and form a thick type of growth. These plants should be thinned out frequently to produce heavier yields. Other seedlings tend to grow upright and with open growth; the upright branches can be cut back to encourage more side branching. The pruning can be done in the late fall and winter months during the dormant period and before new growth begins.

Insects and Other Pests. The West Indian cherry is infested by several types of scale insects and these infestations are followed by sooty mold. Oil emulsion spray or parathion, or a mixture of both, may be used if infestations become too severe. It is not recommended, however, that the plants be sprayed with oil and parathion during periods of fruiting. At least three species of plant bugs have been observed to sting the fruit, resulting in misshapen and pitted fruits. The southern green stink bug or pumpkin bug, and the leaf-footed plant bug have done the most damage to the fruit. It is usually not necessary to apply control measures, since the fruit flavor does not seem to be affected by these bugs.

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The root-knot nematode has been found infesting roots of the West Indian cherry. This nematode weakens the plant, and severe infestations may inhibit its growth and result in poor fruit production. The nematode is one of the limiting factors in growing the West Indian cherry in Florida. It is more of a problem in the sandy acid soils than in the alkaline rock soils of Dade County. If the plants are mulched heavily with straw or some other suitable material, fertilized regularly, and watered during dry periods, they will grow, flower, and fruit well in spite of the root-knot.

The use of species of *Malpighia* that are root-knot tolerant or resistant as a root stock for the West Indian cherry has been tried, but the plants thus grown tend to be dwarf and produce low yields.

SELECTED CLONES

There are no named varieties of the West Indian cherry, although several selected clones have been propagated at the Sub-Tropical Experiment Station and are on test. Some are tart or acid and one selection is sweet. The tartness of the fruits is not an indication of the amount of ascorbic acid content, for the sweeter tasting varieties have as high ascorbic acid content as some of the tart ones.

When grown from seeds, considerable variation occurs. In selecting seedlings for propagation by vegetative means the following should be considered. 1) They should produce heavy yields. There is no standard that can be set up to determine this except by taking yield records of many different seedlings and comparing them. The higher yielding seedlings should be selected for propagation. 2) The plants producing the largest fruits along with heavy production should be selected. 3) Those fruits with high juice content are preferred. This is usually associated with large size. 4) Those fruits with high vitamin C content are perhaps most desirable, although since most seedlings have more vitamin C than other fruits this may not be so important for the average grower. Any fruit that analyzes over 1,000 mg. per 100 g. would be satisfactory. However, if the vitamin C were to be extracted or used to enrich other fruit juices, those clones possessing the highest vitamin C content would be preferred. 5) The flavor of the fruit, whether tart or sweet, depends on the use of the variety. For home planting, to eat the fruit out-of-hand, a sweeter tasting one is preferred. For processing or freezing, the tart varieties are some times preferred. 6) The growth habit is important; the more erect, open growth is preferred to the lower, spreading and thick type of growth.

USES*

The skin of the fruit of the West Indian cherry is very tender and easily bruised when handled. It will not hold up well after harvest and, therefore, should be utilized as soon as possible. Its main use as a dooryard fruit is as a fresh fruit eaten out-of-hand, but if the fruit is utilized shortly after harvest, it can be used in various ways, such as a juice, ice, sherbet, syrup, ice cream, jelly, preserves, punch, etc. The fruit is not very satisfactory for pies and jam, as the pits do not separate easily from the flesh.

In selecting the fruit for processing, half-ripe fruit, as well as ripe fruit, can be used. Only the too-green or very overripe fruit should be discarded. In

* Thanks are expressed to Mr. George MacFie of the University of Miami Food Laboratory for information concerning some of the uses of the West Indian cherry.

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extracting the juice on a large scale, a paddle-pulper, similar to that used in making tomato juice, can be used to mash the fruit and to eject the seeds and pulp. An electric blender may be used provided it is not used too long, as the stones will be chopped up and add a bitter flavor to the juice.

Ice. One of the easiest and most satisfactory method of utilizing the fruit, is as a frozen juice or ice. The fruit is washed, mashed, put through a sieve to take out the pulp and seeds; sugar is added and the mixture is frozen. The juice can be frozen in any type of ice box container--plastic box, polyethylene bag, or even in a paper milk carton. When served, the ice is cut into squares as individual pieces and served while still frozen.

Juice. The freshly squeezed, strained, and sweetened juice can be served as a fresh fruit juice. Lime juice can be added to make the following concentrate: 1 part West Indian cherry juice, 1 part lime juice and 1 part sugar. This mixture is frozen in containers similar to those used for concentrated citrus juices. When served, 3 parts water are added to 1 part concentrate.

The juice blends well with mango concentrate, and also with pineapple and soursop juices. It also blends well with orange juice and can be used to build up the flavor, color, and ascorbic acid content of certain types of low solid orange juices. One commercial use of "Acerola" juice is as an additive to apple juice to supply a natural source of vitamin C for baby food juices.

The juice blends well with rum, as well as gin, to make a refreshing drink. The juice can also be fermented to make a wine.

It has been suggested that the juice can be used as an anti-oxident for preserving dried and frozen fruit. The ascorbic acid is used with citric acid for this purpose. The mixture is effective in preventing browning which takes place during the drying of many fruits.

Syrup. To the freshly squeezed juice, pectin and sugar are added to make a light syrup. This can be used over ice cream, pancakes, waffles, cereal, and fresh fruit slices.

Jelly. A good jelly can be made from the fruit. The juice should be strained and put through a fine cloth to make a clear jelly. Pectinol can be added to digest the pectin to give a clear jelly.

Ice Cream. The syrup can be mixed with vanilla ice cream. Or the syrup can be injected into vanilla ice cream to make a variegated type, similar to the new type of orange and mango ice creams.

Preserves. The fruit can be cooked whole, with added sugar, taking care that the fruits are not cooked to a mush, and sealed in jars as a preserve.

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