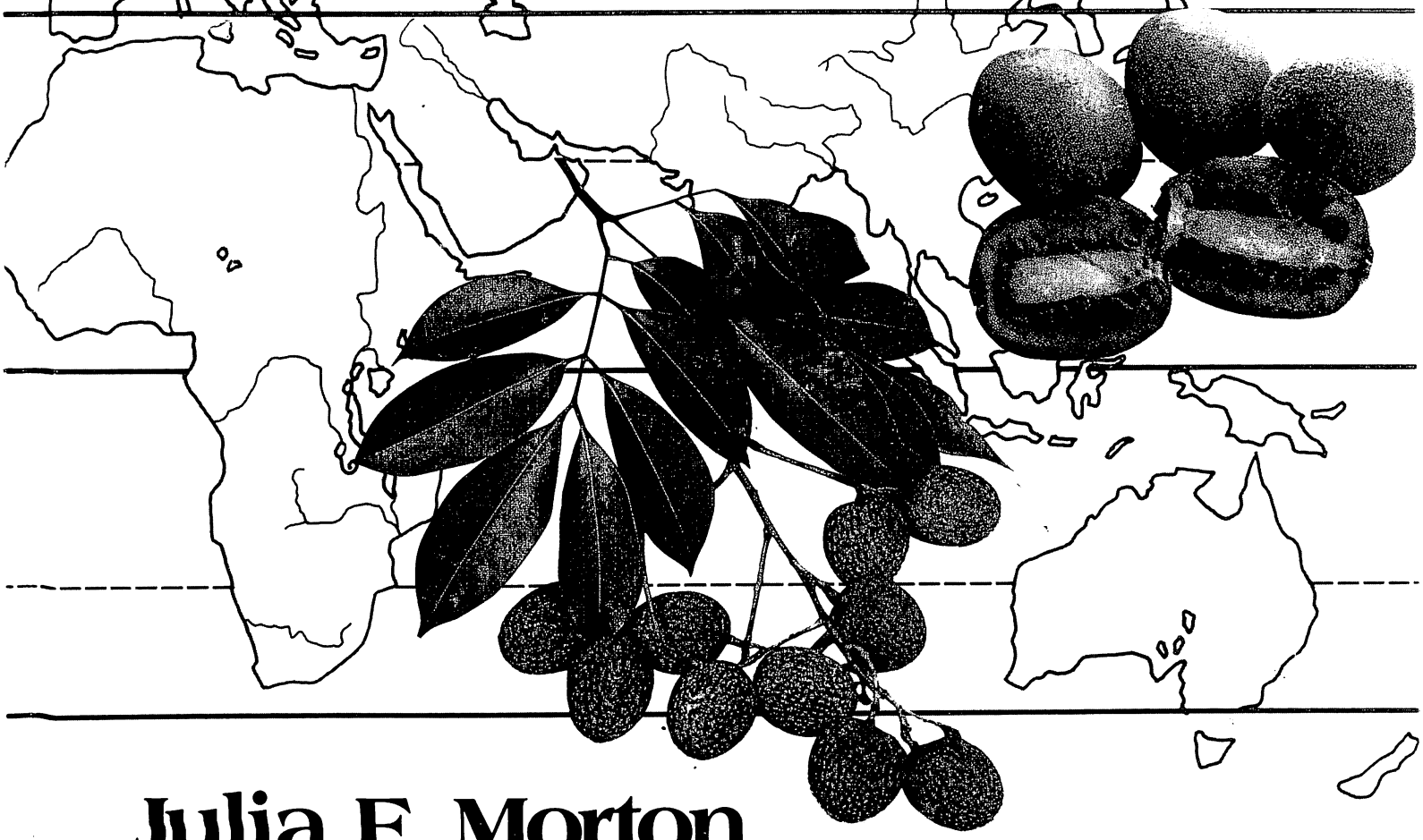
# FRUITS OF WARM CLIMATES



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# Jaboticabas (Plate LI)

Little known outside their natural range, these members of the myrtle family, Myrtaceae, are perhaps the most popular native fruit-bearers of Brazil. Generally identified as *Myrciaria cauliflora* Berg. (syn. *Eugenia cauliflora* DC.), the names *jaboticaba, jabuticaba* or *yabuticaba* (for the fruit; *jaboticabeira* for the tree) actually embrace 4 species of very similar trees and fruits: *M. cauliflora, sabará jaboticaba,* also known as *jabuticaba sabará, jabuticaba de Campinas, guapuru, guaperu, hivapuru,* or *ybapuru; M. jaboticaba Berg.,* great jaboticaba, also known as *jaboticaba de Sao Paulo, jaboticaba do mato, jaboticaba batuba, jaboticaba grauda; M. tenella* Berg., *jaboticaba macia,* also known as *guayabo colorado, cambui preto, murta do campo, camboinzinho; M. trunciflora* Berg., long-stemmed jaboticaba, also called *jaboticaba de Cabinho,* or *jaboticaba do Pará.*

The word "jaboticaba" is said to have been derived from the Tupi term, *jabotim,* for turtle, and means "like turtle fat", presumably referring to the fruit pulp.

## Description

Jaboticaba trees are slow-growing, in *M. tenella,* shrubby, 3½ to 4½ ft (1-1.35 m) high; in *M. trunciflora,* 13 to 23 or rarely 40 ft (4-7 or 12 m); in the other species usually reaching 35 to 40 ft (10.5-12 m). They are profusely branched, beginning close to the ground and slanting upward and outward so that the dense, rounded crown may attain an ultimate spread of 45 ft (13.7 m). The thin outer bark, like that of the guava, flakes off, leaving light patches. Young foliage and branchlets are hairy.

The evergreen, opposite leaves, on very short, downy petioles, are lanceolate or elliptic, rounded at the base, sharply or bluntly pointed at the apex; 1 to 4 in (2.5-10 cm) long, ½ to ¾ in (1.25-2 cm) in width; leathery, dark-green, and glossy. Spectacularly emerging from the multiple trunks and branches in groups of 4, on very short, thick pedicels, the flowers have 4 hairy, white petals and about 60 stamens to 1/6 in (4 mm) long. The fruit, borne in abundance, singly or in clusters, on short stalks, is largely hidden by the foliage and the shade of the canopy, but conspicuous on the lower portions of the trunks. Round, slightly oblate, broad-pyriform, or ellipsoid, with a small disk and vestiges of the 4 sepals at the apex, the fruits vary in size with the species and variety, ranging from ¼ in (6 mm) in *M. tenella* and from 5/8 to 1½ in (1.6-4 cm) in diameter in the other species. The smooth, tough skin is very glossy, bright-green, red-purple, maroon-purple, or so dark a purple as to appear nearly black, slightly acid and faintly spicy in taste; encloses a gelatinous, juicy, translucent, all-white or rose-tinted pulp that clings firmly to the seeds. The fruit has an overall subacid to sweet, grapelike flavor, mildly to disagreeably resinous, and is sometimes quite astringent. There may be 1 to 5 oval to nearly round but flattened, hard to tender, light-brown seeds, ¼ to ½ in (6-12.5 mm) long, but often some are abortive. The fruit has been well likened to a muscadine grape except for the larger seeds.

## Origin and Distribution

*M. cauliflora* is native to the hilly region around Rio de Janeiro and Minas Gerais, Brazil, also around Santa Cruz, Bolivia, Asunción, Paraguay, and northeastern Argentina. *M. jaboticaba* grows wild in the forest around Sao Paulo and Rio de Janeiro; *M. tenella* occurs in the arid zone of Bahia and the mountains of Minas Gerais; in the states of Sao Paulo, Pernambuco and Rio Grande do Sul; also around Yaguarón, Uruguay, and San Martin, Peru. *M. trunciflora* is indigenous to the vicinity of Minas Gerais.

Jaboticabas are cultivated from the southern city of Rio Grande to Bahia, and from the seacoast to Goyaz and Matto Grosso in the west, not only for the fruits but also as ornamental trees. They are most common in parks and gardens throughout Rio de Janeiro and in small orchards all around Minas Gerais. Many cultivated forms are believed to be interspecific hybrids.

An early "hearsay" account of the jaboticabas of Brazil was published in Amsterdam in 1658. The jaboticaba was introduced into California (at Santa Barbara) about 1904. A few of the trees were still living in 1912 but all were gone by 1939. In 1908, Brazil's National Society of Agriculture sent to the United States Department of Agriculture plants of 3 varieties, **'Coroa', 'Murta',** and **'Paulista'.** The first 2 died soon but 'Paulista' lived until 1917. A Dr. W. Hentz bought 6 small inarched plants in Rio Janeiro in 1911 and planted them in City Point, Brevard County, Florida. Only one, variety 'Murta', survived and he moved it to Winter Haven in 1918. It began fruiting in 1932 and continued to bear in great abundance. Another introduction was made by the U.S. Department of Agriculture in 1913 in the form of seeds collected by the plant explorers, P.H. Dorsett, A.D. Shamel, and W. Popenoe from marketed fruits in Rio de Janeiro, the best of which was described as 1½ in (3.8 cm) thick. In 1914, the U.S. Department of Agriculture received seeds from 40 lbs (28 kg) of fruit purchased in the public market in Rio de Janeiro, which appeared different from previous introductions being purple-maroon, round or slightly oblate, and, at most, not quite 1 in (2.5 cm) in diameter. Plants

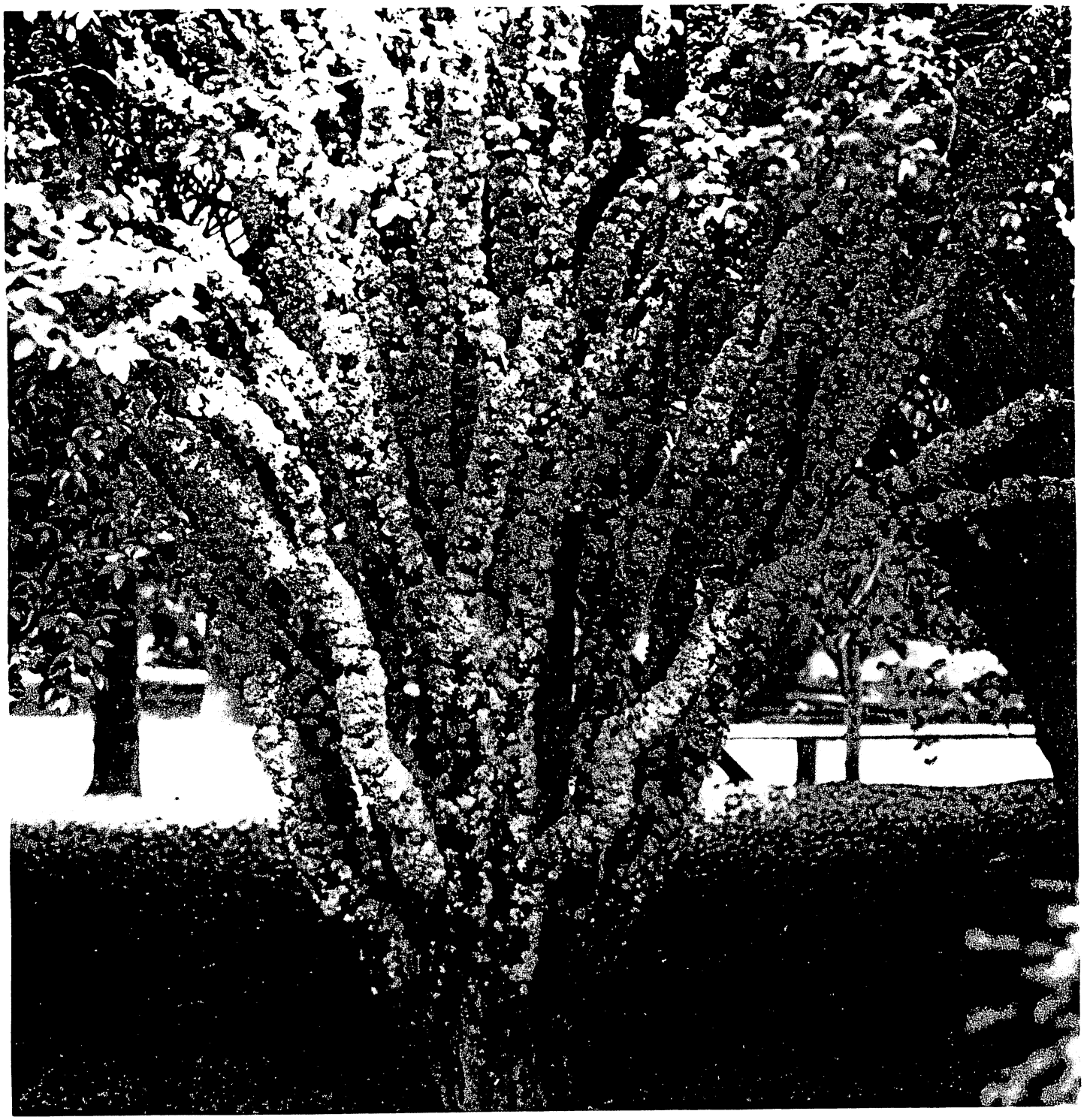

Fig. 101: A jaboticaba tree in full bloom in Brazil is a striking example of cauliflory (flowers arising from axillary buds on main trunks or older branches).

grown from these seeds, believed to represent more than one species, were distributed to Florida, California and Cuba. A seedling of *M. trunciflora* from this lot was, up until 1928, grown at the Charles Deering estate, Buena Vista, Florida, and then transferred to the then U.S.D.A. Plant Introduction Station (now the Subtropical Horticulture Research Unit) on Old Cutler Road. It made poor growth in the limestone, but survived.

In 1918, seeds were presented to the U.S. Department of Agriculture by the Director of the Escola Agricola de Lavras in Minas Gerais, and most of the resulting trees were growing at the Brickell Avenue Garden until 1926 when they were killed by the 3 ft (1 m) of salt water pushed over the garden by the disastrous hurricane of that year. Dr. David Fairchild rejoiced that, in 1923, he had set out two of the seedlings at his home, "The Kampong", in Coco-

nut Grove and these lived; one fruiting for the first time in 1935. Seedlings of the same lot were successfully grown and fruited heavily at the Atkins Garden of Harvard University at Soledad, near Cienfuegos, Cuba.

In 1920, Dr. Fairchild and P.H. Dorsett took several young trees to Panama and planted them at Juan Mina at sea-level where they grew well and fruited for many years. Later, jaboticabas were set out in the new Summit Botanic Garden. Between 1930 and 1940, plants presumably from the Summit Garden, were installed at the Estacion Agrícola de Palmira, in southern Colombia.

Seeds were sent from Washington to the Philippines in 1924. Plants were sent to Puerto Arturo, Honduras, and transferred to the Lancetilla Experimental Garden, at Tela, in 1926 and again in 1929. Other plants were transferred from the Summit Garden in 1928. The trees flourished and fruited well in Honduras. Dr. Hamilton P. Traub, of the Orlando, Florida, branch of the U.S. Department of Agriculture, was establishing a 2½ acre (nearly 1 ha) experimental block of jaboticabas in 1940 for testing and study. At that time there were only a few bearing trees in the state. Soon, nurseries began selling grafted trees and they began appearing in home gardens.

## Varieties

*M. cauliflora* differs mainly from the other species in the large size of the tree and of the fruits. The well-known variety 'Coroa' is believed to belong to this species, also 'Murta' which has smaller leaves and larger fruits. The latter was among those sent to California in 1904.

Among commercial sorts in Brazil are:

**'Sabará'**, a form of *M. cauliflora,* is the most prized and most often planted. The fruit is small, thin-skinned and sweet. The tree is of medium size, precocious, and very productive. Early in season; bears 4 crops a year. Susceptible to rust on flowers and fruits.

**'Paulista'**—fruit is very large, with thick, leathery skin. The tree is a strong grower and highly productive though it bears a single crop. Later in season than 'Sabará'. Fruits are resistant to rust. Was introduced into California in 1904.

**'Rajada'**—fruit very large, skin green-bronze, thinner than that of 'Paulista'. Flavor is sweet and very good. The tree is much like that of 'Paulista'. Midseason.

**'Branca'**—fruit is large, not white, but bright-green; delicious. Tree is of medium size and prolific; recommended for home gardens.

**'Ponhema'**—fruit is turnip-shaped with pointed apex; large; with somewhat leathery skin. Must be fully ripe for eating raw; is most used for jelly and other preserves. Tree is very large and extremely productive.

**'Rujada'**—fruit is striped white and purple.

**'Roxa'**—an old type mentioned by Popenoe as being more reddish than purple, as the name (meaning "red") implies.

**'Sao Paulo'** (probably *M. jaboticaba)*—tree is large-leaved.

**'Mineira'**—was introduced into California in 1904.

## Pollination

It has been reported from Brazil that solitary jaboticaba trees bear poorly compared with those planted in groups, which indicates that cross-pollination enhances productivity.

## Climate

In Brazil, jaboticabas grow from sea-level to elevations of more than 3,000 ft (910 m). At Minas Gerais, the temperature rarely falls below 33°F (0.56°C). Trees in central Florida have lived through freezing weather. In 1917, one very young jaboticaba tree at Brooksville survived a drop in temperature to 18°F (-7.78°C), only the foliage and branches being killed back. In southern Florida, jaboticabas have not been damaged by brief periods of 26°F (-3.33°C).

## Soil

Jaboticaba trees grow best on deep, rich, well-drained soil, but have grown and borne well on sand in central Florida and have been fairly satisfactory in the southern part of the state on oolitic limestone.

## Propagation

Jaboticabas are usually grown from seeds in South America. These are nearly always polyembryonic, producing 4 to 6 plants per seed. They germinate in 20 to 40 days.

Selected strains can be reproduced by inarching (approach-grafting) or air-layering. Budding is not easily accomplished because of the thinness of the bark and hardness of the wood. Side-veneer grafting is fairly successful. And experimental work has shown that propagation by tissue culture may be feasible.

At the Agricultural Research and Education Center in Homestead, Florida, 6 related genera, including 10 species, were tried as rootstocks in grafting experiments but none was successful. However, *M. cauliflora* scions were satisfactorily joined to rootstock of the same species ⅛ to ¼ in (3-6 mm) thick, bound with parafilm and grown in plastic bags under mist.

## Culture

Jaboticaba trees in plantations should be spaced at least 30 ft (9 m) apart each way. Dr. Wilson Popenoe wrote that in Brazil they were nearly always planted too close—about 15 ft (4.5 m) apart, greatly restricting normal development.

Growth is so slow that a seedling may take 3 years to reach 18 in (45 cm) in height. However, a seedling tree in sand at Orlando, Florida, was 15 ft (4.5 m) high when 10 years old. Others on limestone at the United States Department of Agriculture's Subtropical Horticulture Research Unit were shrubby and only 5 to 6 ft (1.5-1.8 m) high when 10 and 11 years old. Seedlings may not bear fruit until 8 to 15 years of age, though one seedling selection flowered in 4 to 5 years. Grafted trees have fruited in 7 years. One planted near Bradenton, Florida, in bagasse-enriched soil started bearing the 6th year. The fruit develops quickly, in 1 to 3 months, after flowering.

Traditionally, jaboticabas have not been given fertilizer in Brazil, the belief prevailing that it might be prejudicial rather than beneficial because of the sensitivity of the root system. Some agronomists have advocated digging a series of pits around the base of the tree and filling them with organic matter enriched with 1 part ammonium sulfate, 2 parts superphosphate, and 1 part potassium chlo-

rate. The pits store and gradually release the nutrients and the water from the fall rains.

In 1978, E.A. Ackerman of the Rare Fruit Council International, Inc., reported on fertilizer experiments with 63 one-year-old and 48 two- and three-year-old seedlings in containers. Better growth was obtained with plants in a mixture of equal amounts of acid sandy muck, vermiculite, and peat, given feedings of 32 g of 14-14-14 slow-release fertilizer (Osmocote), roughly every 2½ months, and 3 gallons (11.4 liters) of well water (pH 7.20) by a drip system every 2 days over a period of 18 months, than plants given other treatments. The addition of chelated iron was of no advantage; chelated zinc retarded growth rate, chelated manganese stopped growth and caused defoliation. Abundant water was found to be essential to survival. Irrigation to promote flowering in the dry season is recommended in Brazil to avoid the detrimental effects of flowering in the rainy season.

### Season

The time of fruiting varies with the species and/or cultivar and, of course, the locale. In Rio de Janeiro, *M. cauliflora* fruits in May and *M. jaboticaba* in September. If the trees are heavily irrigated in the dry season, they may bear several crops a year. Trees in southern Florida usually produce 2 crops a year.

### Harvesting and Packing

In Brazil, jaboticabas harvested in the interior are shipped crudely in second-hand wooden boxes to urban markets. The toughness of the skin prevents serious bruising if the boxes are handled with some care.

### Keeping Quality

Jaboticabas, once harvested, ferment quickly at ordinary temperatures.

### Pests and Diseases

If the jaboticaba blooms during a period of drought, many flowers desiccate. If blooming occurs during heavy rains, many flowers will be affected by rust caused by a fungus. The variety 'Sabará' is particularly susceptible to attacks of rust on the flowers and fruits. This is the most serious disease of the jaboticaba in Brazil. The initial signs are circular spots, at first yellow then dark-brown.

Fruit-eating birds are very troublesome to jaboticaba growers in Brazil. To protect the crop, double-folded newspaper pages are placed around individual clusters and tied at the top. If birds are very aggressive, or if there are high winds, the paper must be secured with string at the bottom also. To facilitate this operation, it may be necessary in winter or early spring to do some pruning to make it easier to climb the trees and this will result in protecting a larger portion of the crop. Furthermore, reducing the number of fruits has the effect of increasing the size of those that remain. In Florida, raccoons and opossums make raids on jaboticabas.

### Food Uses

Jaboticabas are mostly eaten out-of-hand in South America. By squeezing the fruit between the thumb and forefinger, one can cause the skin to split and the pulp to slip into the mouth. The plant explorers, Dorsett, Shamel and Popenoe, wrote that children in Brazil spend hours "searching out and devouring the ripe fruits." Boys swallow the seeds with the pulp, but, properly, the seeds should be discarded.

The fruits are often used for making jelly and marmalade, with the addition of pectin. It has been recommended that the skin be removed from at least half the fruits to avoid a strong tannin flavor. In view of the undesirability of tannin in the diet, it would be better to peel most of them. The same should apply to the preparation of juice for beverage purposes, fresh or fermented. The aborigines made wine of the jaboticabas, and wine is still made to a limited extent in Brazil.

| Food Value Per 100 g of Edible Portion* | |
|---|---|
| Calories | 45.7 |
| Moisture | 87.1 g |
| Protein | 0.11 g |
| Fat | 0.01 g |
| Carbohydrates | 12.58 g |
| Fiber | 0.08 g |
| Ash | 0.20 g |
| Calcium | 6.3 mg |
| Phosphorus | 9.2 mg |
| Iron | 0.49 mg |
| Carotene | - |
| Thiamine | 0.02 mg |
| Riboflavin | 0.02 mg |
| Niacin | 0.21 mg |
| Ascorbic Acid** | 22.7 mg |
| *Amino Acids:* | |
| Tryptophan | 1 mg |
| Methionine | - |
| Lysine | 7 mg |

*Analyses made in 1955 at the Laboratories FIM de Nutricion, Havana, Cuba.

**Others have shown 30.7 mg.

### Toxicity

Regular, quantity consumption of the skins should be avoided because of the high tannin content, inasmuch as tannin is antinutrient and carcinogenic if intake is frequent and over a long period of time.

### Medicinal Uses

The astringent decoction of the sun-dried skins is prescribed in Brazil as a treatment for hemoptysis, asthma, diarrhea and dysentery; also as a gargle for chronic inflammation of the tonsils. Such use also may lead to excessive consumption of tannin.