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Jaboticaba

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Myrciaria cauliflora Berg.
Syn. *Eugenia cauliflora*
Family: Myrtaceae

Jaboticaba is a very slow-growing tree that branches profusely from near the ground, with the branches slanting upward and outward. The thin outer bark flakes off, leaving light patches. The tree can reach a height of 25 feet, with a dense, rounded crown that spreads to 50 feet. The flowers emerge from the trunks and branches in small groups. Each flower has four hairy white petals and about 60 4-mm-long stamens. The dark purple, usually round, sometimes ellipsoid fruit occurs on short stalks, singularly or in clusters. The fruits range in diameter from 0.5 to 1.5 inches, although some varieties, like 'Paulista', can reach 3 inches. The tough skin encloses a gelatinous, juicy, translucent, all-white or rose-tinted pulp that clings firmly to the seeds. In Hawai'i trees produce from almost sea level to upwards of 4000 feet elevation. The fruit skins have high tannin content.

Other common names

jaboticaba, Brazil grape tree, (English); sabará jaboticaba, jabuticaba sabará, jabuticaba de Campinas, guapuru, guaperu, hivapuru, and ybapuru (Brazil). The names jaboticaba, jabbuticaba, and yabuticaba are often used to describe four similar species of *Myrciaria*. The word comes from the Tupi Indian term *jabotim* for turtle and means "like turtle fat" in reference to the white fruit pulp.

Origin

This *Myrciaria* species is native to southern Brazil and also parts of Bolivia, Paraguay, and Argentina. It was first mentioned by the Dutch in 1658 but did not arrive in California until 1904 and Florida in 1908. Trees in Hawai'i indicate that the fruit may have also arrived there during the early 1900s. By the 1940s, grafted trees were being sold in Florida nurseries.

Cultivars

Myrciaria cauliflora cultivars include 'Paulista', 'Rajada', 'Roxa', 'Ponhema', 'Mineira', 'Branca', 'Sabara', precoce, hibrida, 'Ascuda', pingo de mel, (Brazil) younghans, 'Sabara', and 'J1' (Australia).

There are more than 40 *Myrciaria* species including *M. dubia* (camu camu), *M. glomerata* (amarilla), *M. tenella* (cambui), *M. trunciflora* (cabinho), *M. vexator* (moraleta), *M. aureana* (white jaboticaba) *M. coronata, M. grandifolia, M. jaboticaba, M. oblongata,* and *M. phitrantha*. These other *Myrciaria* species may exist in Hawai'i but are very rare.

Environment

Access to water is essential for tree survival during periods of drought. Rain or irrigation will promote flowering. Depending on rain or irrigation, trees in Hawai'i can produce from one to six crops each year. Fruit size can be

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greatly affected by water during the fruit growing cycle. The trees do best in deep, well drained soil.

Propagation

Seeds should be planted as soon as possible after harvest. It takes approximately 2 months for germination. The polyembryonic seeds can each produce up to six plants. Inarching, air layering, grafting, cuttings, and tissue culture are all possible but have had limited success. Grafts should be on the *M. cauliflora* rootstock.

Culture and management

In the early 1900s, plant explorer and horticulturalist Wilson Popenoe wrote that trees planted in Brazil at 15 feet apart were too close and normal growth was restricted. He felt that 30 feet was the correct spacing without pruning. Currently in Brazil, 20 x 20 feet or 20 x 15 feet is recommended. In Hawai'i, jaboticaba trees usually are intercropped with coffee, macadamia, or other fruit trees. Observations at several South Kona farms found the trees planted as little as 6 feet from other trees but still producing a copious amount of fruit.

These very slow-growing trees may grow only 18 inches in 3 years and not bear fruit until as old as 18 years. Some trees in Hawai'i locations under optimal conditions might fruit as early as 8 years. Few fertilizer recommendations have been published, although NPK 14-14-14 has been used in Florida tests. In Hawai'i, 8-8-8 or 6-6-6 has been applied quarterly. It is always recommended to have the soil checked for possible micronutrient deficiencies. The tree has a shallow root system, and mulching is advised, especially in periods of drought. Dead wood should be removed from the tree. As the fruit is borne on the trunk and branches, most growth is left intact to increase production. Trees are sometimes pruned to facilitate access to inner braches. Platforms have been built inside upper areas on some old-growth trees to ease harvesting from higher branches. Fruit thinning within clusters helps to increase the size of the remaining fruit.

Pests and diseases

A few trees have been affected by rust (*Puccinia psidii* G.) during rainy seasons. The largest problems facing commercial orchards are birds and small mammals. In Brazil, bagging is sometimes used to protect the fruit.

Jaboticaba flowers

Harvesting and yield

In Brazil, the plant fruits two times a year. Production in Hawai'i depends on rainfall, with fruit set from one to six 6 times per year on established seedling trees in North and South Kona, at elevations from 500 to 2500 feet. Selected cultivars like 'Paulista' will set fruit only one or two times per year in Hawai'i. The average yield of a mature tree can be well over 1000 pounds of fruit. Jaboticaba fruit are ready to harvest when they are full color and are somewhat soft. Fruits mature over a period of about two weeks on an individual tree and may require frequent harvests. The fruits are thought to withstand bruising because of the somewhat thick skin, although careful handling is still recommended. In Hawai'i, fruits are often picked and placed in 5-gallon buckets. This often leads to crushing of the fruit at the bottom of the bucket.

Postharvest considerations

The fruit has a storage life of no more than 3 days at ambient temperatures. In some larger production areas,

coating the fruit with wax and wrapping it in plastic increases the storage life to 21 days if held at 53°F. The fruit should be chilled as soon as possible after harvest. Harvesting from the tree directly into small coolers in the field prolongs shelf life.

Packaging, pricing, and marketing

Commercial growers in Hawai'i package jaboticaba fruits in small plastic "clamshells" for sales to groceries or larger clamshells or small boxes for sales to restaurants or value-added product producers. Wholesale prices range from $0.75 a pound to $2.00 a pound. Larger sized, washed and graded fruit will bring a higher price. The very large fruits from 'Paulista' will wholesale for $2.00–3.00 a pound. The 'Paulista' fruit may reach baseball size in areas with sufficient water. Some jaboticaba fruit is sold to wineries on Maui and the Big Island. Groceries sell fruit packaged in small plastic bags or clamshells for an average of $2.00 a pound. At farmers' markets, the fruit is sold in small clamshells with 15 fruits for around $2.00, or $1.50 to $2.00 a pound.

Nutritive value

Fruit composition of jaboticaba, which has an edible flesh to fruit ratio from 60 to 70 percent (Morton 1987; Oliveira et al. 2003).

Proximate (%)	
water	87.1
energy (Kcal)	45.7
protein	0.11
lipid (fat)	0.01
carbohydrate	12.6
fiber	0.08
ash	0.2
Minerals (mg)	
calcium	6.3
iron	0.49
phosphorus	9.2
Vitamins (mg)	
ascorbic acid	15–30.7
thiamin	0.02
riboflavin	0.02
niacin	0.21
tryptophan	1 mg
lysine	7 mg

Jaboticaba cultivar 'Paulista'

Culinary and other uses

Although usually eaten fresh, the fruit is often used for jelly, syrups, ice cream, sweet and savory sauces, and made into wine.

Recipes

Jaboticaba Chocolate Mousse with White Rum

Cathy Smoot Barrett
Kailua Candy Company

For mousse

1 lb melted Original Hawai'ian Chocolate Companies dark chocolate
⅓ c warm jaboticaba puree
⅓ c warm white rum
21 egg whites
1 c heavy cream

In a stainless steel bowl, add warm liquid to melted chocolate. Mix with whisk until liquid is incorporated into the chocolate. In a separate bowl, whip egg white until stiff. Fold into chocolate mixture by hand. In the same bowl, whip heavy cream and fold into chocolate mixture by hand. Refrigerate until ready to use.

For chocolate cups

1¼ lb melted and tempered Original Hawaiian Chocolate Companies milk chocolate
60 small balloons

Dip the balloons one at a time into the tempered choco-

late and set on parchment paper to set up. When set, pop the balloons and remove to form chocolate cups. Pipe mousse into chocolate cups. Makes 60 small servings.

Jaboticaba Dipping Sauce

Teri Wisdom
Hawai'i Community College, West Hawai'i Culinary Arts

1 c fresh jaboticaba
3 oz fresh squeezed orange juice
4 oz jaboticaba jelly
2 cloves
2 bay leaves
1 cinnamon stick

Slurry to desired consistency. Simmer 15 minutes and strain.

Jaboticaba Jelly

Shonn Takiue
Hawai'i Community College, West Hawai'i Culinary Arts

Wash freshly picked jaboticaba. Put fruit into stockpot. Add water to just under level of fruit. Bring to boil while stirring and smashing fruit. Strain fruit in jelly bag or chinois. When remaining pulp is cool, squeeze by hand. Add this to strained juice as it helps to increase color and taste. Measure 8 cups of juice (remainder can be frozen for future use). Bring juice to boil. Add 4 boxes of pectin and return to boil. Add 8 cups sugar and return to boil. Remove from fire and fill sterilized jars. Seal and boil jars for 20 minutes with 2 inches or more of water covering jars. Remove from water and let cool.

Cost of production

It is essential that growers determine their own cost of production for each crop in each growing location. Including *all* the variables in figuring your cost to produce a specific crop is key to farm sustainability. A few of the operating (or "variable") costs include fertilizer, weed control, pest control, pruning, irrigation, harvesting, marketing, and operations overhead. Ownership (or "fixed") costs also need to be taken into account. For detailed information on the various types of cost, see "The economics of cacao production in Kona" (www.ctahr.hawaii.edu/oc/freepubs/pdf/AB-17.pdf).

The cost-of-production spreadsheet on the following pages can be downloaded as a Microsoft Excel file from www.ctahr.hawaii.edu/oc/freepubs/spreads/6fruits.xls.

Selected references

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Popenoe, Wilson. 1920. Manual of tropical and subtropical fruits. Hafner Press. p. 299–302.

Silva, Silvestre, and Helena Tassara. 2003. Frutas no Brasil. Editara Editora Ltda. Brazil [in Portuguese]. p. 144–147.

Internet resources

Fruits of warm climates, by Julia F. Morton
www.hort.purdue.edu/newcrop/morton/index.html
Montoso Gardens
www.montosogardens.com
Plant Resources of Southeast Asia
www.prosea.lipi.go.id
International Tropical Fruit Network
www.itfnet.org

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Assumptions: *(Data entries are annual amounts expressed on a per tree basis)*

Fruit tree => JABOTICABA

1. Average number of bearing trees *(counted)*		4	trees	
2. Yield (*expressed in number of fruit [F] or lb.*)	P	100	lbs. / tree	
3. Average wt. (ozs.) / fruit =	1.0	ounces		
4. Total lbs. harvested/ tree =	100.0	lbs. gross yield	6. Wage rate ($/hr.) =	$12.00
5. Marketable yield /tree (%) =	100%	of the gross yield	7. Benefits (FICA, etc.) (%) =	33.3%

To calculate profitability: Enter wage rate & benefits actually paid (or the rates one would to pay if labor were hired.) To calculate cash flow enter nothing. The cash flow result is (except for depreciation considerations) one's taxable income.

Gross Revenue:	% of total	$/lb:	Lbs./tree/yr.		$ /tree /yr.:	$ /total crop /yr.	% of gross
1 Wholesale sales	50%	1.50	50.0	marketable lbs.	75.00	300	38%
2 Retail sales	50%	2.50	50.0	marketable lbs.	125.00	500	63%
Total sales = *Weighted ave. price/lb. =* $2.000			**100.0**	marketable lbs.	200.00	800	100%

Operating Costs: *Enter unit quantities as total per year per tree:*

A. Growing costs:	Units:	$/unit:	¢ /lb. of fruit	$ /tree /yr.:	$ /total crop /yr.	% of gross
1 Fertiliziation		*Sub-totals =>*	*0.04*	*4.27*	*17.07*	2%
Fertilizer (lbs.)	2.0	$0.80	0.016	1.60	6.40	
Labor (min.)	10	$0.27	0.027	2.67	10.67	
2 Irrigation: *Assuming ag water rate =*	*$2.00*	*/1,000 gals.* *Sub-total=>*	*0.01*	*1.34*	*5.35*	1%
Water (gallons)	1.5	*$0.002* */ 1,000 gals.*	0.000	0.00	0.01	
Labor (min.)	5	$0.27	0.013	1.33	5.33	
3 Pest control:		*Sub-totals =>*	*0.13*	*12.67*	*50.67*	6%
Materials	1.0	$10.00	0.100	10.00	40.00	
Labor (min.)	10	$0.27	0.027	2.67	10.67	
4 Weed control:		*Sub-totals =>*	*0.01*	*1.33*	*5.33*	1%
Chemicals and/or machinery	0.0	$0.00	0.000	0.00	0.00	
Labor (min.)	5	$0.27	0.013	1.33	5.33	
5 Pruning:		*Sub-totals =>*	*0.04*	*4.00*	*16.00*	2%
Machinery	0.0	$0.00	0.000	0.00	0.00	
Labor (min.)	15	$0.27	0.040	4.00	16.00	
6 Other:		*Sub-totals =>*	*0.00*	*0.00*	*0.00*	0%
Materials and/or machinery	0.0	0.00	0.000	0.00	0.00	
Labor (min.)	0	$0.27	0.000	0.00	0.00	
		Total growing costs =	**0.236**	**23.60**	**94.41**	12%

Enter picking costs based on gross yield and packing and delivery costs based on marketable yield .

B. Harvesting costs:	Average cents per pound		¢ /lb. of fruit	$ /tree /yr.:	$ /enterprise /yr.	% of gross
1 Picking	*12.0*	*¢/lb.*	*12.0*	*12.00*	*48.00*	6%
2a Packing: for wholesale	*22.0*	*¢/lb.*	*11.0*	*5.50*	*22.00*	3%
2b Packing: for retail sales	*81.0*	*¢/lb.*	*40.5*	*40.50*	*162.00*	20%
3 Delivery to market	*6.0*	*¢/lb.*	*6.0*	*6.00*	*24.00*	3%
		Total harvesting costs =	**58.5**	**58.50**	**234.00**	29%
		TOTAL Operating Costs =	**58.7**	**82.10**	**328.41**	41%
		Gross Margin =	**141.3**	**117.90**	**471.59**	58.9%

Break-even analysis:

Given the weighted average price of	$2.000	$/lb. fruit, the mkt. yield required to cover operating costs =	164.2
Given the marketable yield of	100.0	lbs. fruit/ tree, the ave. price req. to cover operating costs =	$0.821

How to calculate your harvesting costs expressed as ¢ / lb:

Picking: *Assume picking labor wage rate =* ***$12.00*** */hour*

1 Weigh *all* of the fruit picked in one harvest year & average it out for one tree. *Ave. gross yield / tree =* 100.0 lbs./year

(Important: The picked fruit yield recorded here is the gross yield and not the marketable yield.)

2 Record how many minutes on average it takes you to pick *all* of the fruit on one tree. **45** minutes

(Note: You will probably havest the tree a number of times during the season. We need the time it takes for the whole crop year.)

3 Divide the ave. gross yield /tree by the ave. time taken to pick. Your average picking rate in pounds per minute = 2.2

4 Divide the hourly wage rate for pickers by 60 minutes.. This will give you the cents per minute wage rate = 20.0

5 Divide this wage rate, in ¢ / min. (result from step 4 above), by the ave. picking rate (in lbs./ min.) (from step 3 above.)

The result is your **cost (in ¢ / lb.) to pick a tree's annual gross yield of fruit =** **9.0 ¢ / lb.**

Example to illustarate the process:

a In one year you picked 1,600 fruit with a total weight of 800 pounds in 1 hour 20 min = 100 minutes. Your average picking rate is: 800 lbs. ÷ 100 minutes = **8 lbs./ min.**

b You would pay pickers $12.00 per hour = 20 ¢ per minute to pick fruit. 12 ÷ 60 = $0.20 or **20¢ per minute**

c Your picking cost / tree is: 20 ¢/min ÷ 8 lbs./ min. = **2.5 ¢/ lb**. per pound of fruit picked

Packing:

1 WHOLESALE: Record the total annual cost for packaging to pack the marketable fruit sold wholesale. **$5.00**

2 Divide this cost by pounds of fruit sold wholesale. (This has been calculated in "Gross Revenue" above) 50.0

Your materials cost in ¢ / lb. = **10.0 ¢ / lb.**

3 If more labor (in addition to the picking labor) is required to pack, calculate its cost in ¢ / lb. as above.

Extra labor required (minutes): **30** Packing rate = 1.7 lbs. / minute Labor cost = **12.0 ¢ / lb.**

4 Add these 2 costs together to obtain the **total packing cost per pound of fruit marketed wholesale =** **22.0 ¢ / lb.**

5 RETAIL: Follow the same proceedure (steps 1 to 4 above) to calculate the cost to pack fruit sold retail.

Total cost of retail packaging = **$34.50** Retail sales = 50.0 pounds Materials cost = 69.0 ¢ / lb.

Extra labor required (minutes): **30** Packing rate = 1.7 lbs. / minute Labor cost = **12.0 ¢ / lb.**

Total packing cost per pound of fruit marketed retail = **81.0 ¢ / lb.**

Example:

a In one year you picked 1,600 pounds of fruit, of which 75% was marketable, that is, 1,200 pounds.

b During the year you used 24 boxes (@ $2 each) to ship 1,200 pounds of fruit to the wholesale market.

c Divide the packaging cost ($48) by the amount of marketable fruit. This will give you the materials cost / lb. of fruit: $48.00 ÷ 1,200 = $0.08 = 4**¢ / lb.**

d During the year 60 minutes of packing labor was required (beyond the picking labor.) Your average packing rate is: 1200 lbs. ÷ 60 min. = **20 lbs. / min**.

e You would pay packers $12.00 per hour (= 20 ¢ per minute) to pack fruit. Your annual packing labor cost /tree is: 20 ¢/min ÷ 20 lbs./ min. = **1.0 ¢/ lb.**

f Add the annual material cost (step c) and labor cost (step e) to obtain your total packing cost / lb. of marketed fruit. 8 ¢/ lb. + 1 ¢ / lb = **9.0 ¢/ lb.** for packing wholesale fruit.

Delivery:

1 Based on your annual records, calucuate your average cost / mile for vehicle & driver to haul boxes: **$1.00**

2 Record the total delivery mileage for one year & estimate a portion to allocate to delivering this crop: **6**

3 Record the total weight of marketable fruit delivered during the year: 100.0

4 Multiply estimated share of mileage times mileage rate & divide by total weight of deliveries: **6.0 ¢ / lb.**

Example:

a You have 10 trees that yield an average of 1,200 lbs of marketable fruit = 12,000 lbs.

b During the year you made 24 deliveries carrying 500 lbs of fruit averaging 20 miles round trip.

c The cost for your vehicle and driver's time averages about $1.00 per mile driven.

Note: Oviously, the average delivery cost / lb. of all fruit marketed, unlike the picking and packing costs per pound of fruit, will vary widely for different growers, depending on their location relative to their markets.

480 miles driven @ $1.00 / mile = **$480** $480.00 transport cost ÷ 12,000 lbs fruit = $0.04 = **4.0 ¢ / lb.** of fruit delivered