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South Florida Cottage Industry with Canistel

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Canistel (*Pouteria campechiana*) (Sapotaceae) is a fruit tree species native to Central America. It is grown in many Central and South American, African, and Asian countries. It is also grown in some U.S. states (Morton, 1992), but nowhere on a large scale. The canistel is commercially a minor fruit crop in South Florida. The attractive color, high carotene content, sweet flavor, and moist flesh of superior types can increase canistel's potential to be grown on a larger commercial scale. The objective of this study is to deliver a reliable overview of the suitability of a canistel industry based on cottage industry products and services. Cottage industry products have been tested using different canistel varieties at the Fairchild Farm in Homestead, Florida, where we have a collection of 12 superior cultivars. 'Bruce', 'Fairchild 2', 'Keisau', 'Oro', and 'Trompo' were tested. Trees have been in production for 9–10 years, with a high, stable yield capacity. The results include recommendations of harvest, postharvest, and processing of the fruit.

Canistel (*Pouteria campechiana*) has been distributed throughout Central America, the Caribbean, some regions of Southeast Asia, and areas of Africa. It was introduced into Florida early in the 20th century and is mostly grown in fruit collections and to a limited extent commercially. Canistel trees have been grown in home plantings along the Southeast and Southwest coasts of Florida and the Florida Keys since the 1940s. Canistel is often seen in backyards and occasionally in fruit collections in South Florida. Canistel varieties are available in South Florida, and some of them are promising because of their high, stable yield capacity for commercial orchards. The canistel is currently produced on a small commercial scale in Miami-Dade County, but exact statistics are not available.

Pouteria campechiana can be used by small- and large-scale ice cream and preserve makers, the dairy product industry, and for baking and pastries. Canistel produces a bright orange-yellow fruit with like-colored skin and flesh. The fruit are typically rounded with a pointed apex and they soften at maturity. The fruit flesh is smooth and has a sweet flavor. The ripened canistel is consumed as a dessert fruit. The flesh of canistel fruit is sometimes incorporated into desserts, such as ice creams and puddings. The fruit generally matures from September to February but some varieties and individual trees produce fruit more or less continuously throughout the year. Canistel is a nutritious fruit and a rich source of polyphenolic antioxidants. It is high in energy, niacin, and carotene, has a fair level of ascorbic acid, and a relatively high content of carotenoid, an organic pigment of yellow, orange, or red color suitable for food application (Ma et al., 2004).

The glossy skin of the canistel fruit is adherent to the flesh and at maturity can be difficult to separate from the flesh. The flesh goes from a rubbery texture with ample latex to a soft and pasty consistency. Inside of the fruit are from one to up to five large black or dark brown, glossy seeds.

The local foods movement and alternatives to traditional agriculture are gaining considerable interest in South Florida. Canistel is an alternative crop for South Florida, with attractive productivity of 136–250 kg of fruit/tree/year (Wasielewski and Campbell, 1997). Harvesting and handling of fruit for processing has the potential to be mechanized with proper pruning, which makes the canistel attractive as a potential crop in South Florida.

This paper provides information on the alternative agricultural uses of canistel beyond a fresh fruit. Cottage industry products have been tested using different canistel varieties at the Fairchild Farm in Homestead, FL, where we have a collection of 12 superior cultivars.

Materials and Methods

For this study, canistel fruit were harvested from five different cultivars and ripened at room temperature for 5–10 days to evaluate the optimum state of maturity. The immature mesocarp contains a high level of sticky latex that renders the fruit unpleasant and difficult to use. The dark yellow to orange color of the flesh upon ripening is pleasing to the eye. It is stable with both heating and freezing. Canistel fruit were all harvested from trees located at the Fairchild Farm, Homestead, FL, which houses the genetic collections of the Fairchild Tropical Botanic Garden. Harvesting was done during the peak season for canistel in South Florida (March–April). Cultivars evaluated were 'Bruce', 'Fairchild 2', 'Keisau', 'Oro', and 'Trompo'.

The main parameter used for harvesting time was color. Fruit ripen at different times on the same tree and sizes and shapes can vary. For the color measurement, the Royal Horticultural Society Color Chart was used, with the corresponding Universal Color Language numbers and names.

Additional information was collected on the fruit at full maturity according to the methods of Crane et al. (2001). Table 1 shows the color at harvesting, days to ripening at room temperature, whole fruit weight and moisture content, processing time, and evaluation of the product.

Each whole fruit per cultivar was weighed at ripening. Fruit were peeled by hand, the seeds removed and sliced for dehydrating. This process can be laborious and difficult due to the sticky nature of the pasty flesh and the difficulty in separating the skin from the flesh and seeds.

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Table1. Canistel cultivars parameters at the time of harvest and processing.

Cultivar	Avg. fruit wt (oz)	Color at harvest	Days to ripening	Moisture content	Dehydrating time (h)	Evaluation of product (flour)
'Bruce'	18–24	14–A	7	79	8.5	Excellent flavor, color
'Fairchild 2'	7–13	16–A	5	89	10.2	Good flavor, poor color
'Keisau'	8–10	14–A	6	75	9	Excellent flavor, color
'Oro'	12–16	14–A	6	76	9	Excellent flavor, color
'Trompo'	9–15	16–A	8	76	10	Good flavor, color

Dehydrator. An Excalibur electric home dehydrator (Excalibur, Sacramento, CA) was used for the experiment with nine removable trays. The electric heating contains temperature controls and fans that assure uniform temperature distribution in the drying chamber. Teflon mesh trays were used because the dried fruit slices do not stick to them (Campbell and Campbell, 1983).

Dehydrating fruit. Firm, ripe fruit were selected and carefully washed and peeled. The pulp was cut into lengthwise slices up to an inch in thickness. The slices were arranged flat on the dehydrating trays, making sure as to not clump the fruit slices together. The temperature control was set to 125 °F to 135 °F and allowed to run until the slices reached the desired consistency without losing yellow color.

Drying time was evaluated for the different cultivars. All cultivars were sliced to the same thickness. Slices were weighed after drying to estimate the moisture content.

$$\text{Moisture Content} = \frac{\text{weight of wet sample} - \text{weight of dry sample}}{\text{weight of wet sample}} \times 100$$

Equipment used. For this study individual canistel fruit were washed, peeled, and cut into chips. The tools, utensils, and other equipment used were measuring cups, measuring spoons, sifter, peeler, grater, utility tray, plates, fork, weighing scale, knife, mixing bowl, working table, and a dehydrator.

Grinding was done using an electric grinding machine until a fine flour-like texture was obtained. The canistel fruit flour was placed in a clean covered jar cover to avoid contamination.

The canistel flour was tested in different recipes sweet and savory as milkshakes, yogurt, bread, ice cream, soup, and pastries. The canistel flour contributes both color and flavor to the recipes.

Results and Discussion

The average time for dehydration in an electric home dehydrator was between 8.5–10.2 h using one-inch thick ripe fruit. All cultivars evaluated ('Bruce', 'Fairchild 2', 'Keisau', 'Oro' and 'Trompo') dried well, with good color and flavor. 'Bruce' had the driest flesh and required the least time in the dehydrator, with an average of 8 h in the dehydrator. 'Fairchild 2' had a much moister flesh and required more time in the dehydrator, with an average of 10.2 h. Also 'Fairchild 2', showed poor color after the dehydration process.

An unusual advantage is that the fruit, when ripe, can be dried and milled into mealy flour. The flour can be shipped long distances, stored for years in airtight containers and can be used for other products. Dry canistel is an extremely versatile and tasty ingredient which blends well with ice creams, baby food, yogurts, pies, cakes, cookie fillings and desserts. The pulp and flour of the canistel retains its nutty aroma, flavor and texture throughout the different processes. It has been shown to be heat and cold stable and is excellent for natural sorbets and other organic products where chemical stabilizers cannot be used.

The canistel and its products have been tested by Fairchild Tropical Botanic Garden of over two decades (Wasielewski and Campbell, 1997), including tasting panels and for value-added products. Many people in the United States say that it tastes and smells like maple syrup. It is a frequent component of milkshakes, typically made with the fruit but without ice cream. This fruit contributes both color and flavor to most dairy products. In South Florida, the canistel fruit and its products are popular in farmer's markets and there is a greater potential for this fruit as a processed product, such as the powder used as an additive to milk or as a natural food coloring agent.

The canistel is still a minor commercial fruit crop in South Florida. However, assured availability of quality raw material on a local level has encouraged businesses to incorporate it into their products. Challenges remain for the canistel due to the lack of mainstream recognition and acceptance of the fruit. Hispanics are increasing familiar with this fruit, but outside of South Florida there is a nearly complete lack of knowledge. The large local Hispanic market in South Florida may be able to absorb large portions of increased production, but without a marketing program, efforts may ultimately be unsuccessful.

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