

PRODUCTION GUIDE FOR CAIMITO

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The caimito (*Chrysophyllum cainito* Linn.) is relatively a minor fruit which is valued not only for its luscious fruit but also for its physical and aesthetic attributes. It is a spreading and very ornamental-looking tree, with graceful branches and richly colored foliage that provide shade and beauty to the environment. It is one of the physically tough trees with resistance to strong winds and typhoons although its leaves are easily damaged by those climatic conditions.

The caimito (*Chrysophyllum cainito* Linn.) belongs to the family Sapotaceae, the family which consists of shrubs and trees of wide distribution mostly in tropical regions. In the Philippines and in some English-speaking countries, the caimito is commonly known as starapple, most likely because of its fruit has the shape and size of an apple, and when cut crosswise through the middle, its seeds spread out starlike. It is also known as golden-leaf tree since the beneath surface of its leaves are velvety, silky and golden-brown when mature, though silvery when young. Sometimes, it is called as milkfruit because of its white and milky juice.

Caimito is indigenous to the West Indies, spread over tropical America and now it is cultivated throughout the tropics. In South-East Asia, it is most frequent in the Philippines, Thailand and Southern Indo-China. Wester (1912) stated that caimito was introduced in the country between 1902 and 1907 by W.S. Lyon, the first horticulturist of the Bureau of Plant Industry. It has become widely distributed throughout the country and successfully grown from Batanes to Sulu, especially in the provinces of La Union, Tarlac, Bataan, Pampanga, Bulacan, Batangas, Cavite and Laguna.

Caimito is grown mostly as a backyard tree or as a component of mixed orchards. The Philippines had an area planted to Caimito of 7,600 hectares in 1998 and a volume of production of 25,389 tons (BAS, 1999).

Botanical Descriptions

Caimito, a hermaphroditic or self-pollinated is an evergreen, thick-crowned, attractive tree growing up to 10-15 m high or more and with a canopy spread of 6-9 m wide or more (Fig. 1). The numerous branches are slender and hanging and the young growths are copper colored covered with fine hairs. The leaves are ovate oblong, 6-18 cm long, 3-8 cm wide, pointed at the tip, blunt or rounded at the base, leathery, light to shiny dark green on upper surface and velvety, silky, russet or golden brown beneath (Fig. 2). The prominent lateral veins make an obtuse angle, almost

perpendicular to the midrib, parallel to each other and run from the midrib towards the edge of the leaf. The petioles are 1.5 cm long. The flowers are purplish white, small, inconspicuous and borne in clusters at the leaf axils of the current season's shoots. There are 5 sepals and a tubular corolla with 5 lobes. They also have sweet fragrant smell.

The fruit is oblong to round, 5-10 cm long, 5-7 cm in diameter and weighs 140-260 g or more each (Fig. 3). The skin is smooth and somewhat glossy, thick and leathery and light green or yellowish green to dark purple when ripe. Each fruit contains 8-10 translucent white segments. The flesh is soft, creamy or purplish, translucent, juicy, melting and deliciously flavored. Each fruit segment usually encloses a seed, but due to abortion, only 4-8 seeds are formed per fruit. The seeds are ovate to elliptical, somewhat flattened, about 2 cm long, 1-2 cm wide, hard, dark brown, glossy and smooth except for a prominent scar on the central surface.

Uses and Nutrient Value

The fruits are delicious as a fresh dessert fruit; it is sweet and best served chilled. The fresh fruit is also often added to salads and may also be used as an ingredient of ice-cream and sherbet. Caimito fruit has 51-70% edible portion and the tough rind is inedible.

Table 1. Food composition of caimito per 100 g edible portion.

Constituents	Types	
	Green	Purple
Moisture (%)	82.6	80.5
Food energy (cal)	67	72
Protein (g)	0.7	1.3
Fat (g)	1.1	0.6
Total carbohydrates (g)	15.3	17.4
Fiber (g)	0.7	Trace
Ash (g)	0.3	0.2
Calcium (mg)	17	14
Phosphorus (mg)	13	9
Iron (mg)	0.4	0.2
Sodium (mg)	8	-
Potassium (mg)	145	-
Vitamin A (I.U.)	10	Trace
Thiamine (mg)	0.02	0.01
Riboflavin (mg)	0.02	0.01
Niacin (mg)	0.8	0.9
Ascorbic acid (mg)	7	6

The bark, leaves, latex, fruit and seeds possess medicinal properties. The bark decoction is good for dysentery and the infusion is tonic and refreshing. The leaf decoction is used for diabetes, hypertension and cancer treatments. The latex is good for abscesses and the dried latex is a drastic anthelmintic. The ripe fruit, because of its mucilaginous character, is eaten to sooth inflammation in laryngitis and pneumonia. The fruit is also a remedy for diabetes while the seed is a tonix, febrifuge and antidiarrhea.

The reddish-brown wood is suitable for construction purposes, and the mature branches are used as a medium to grow orchids. The tree is much appreciated as an ornamental.

Varieties

There are two distinct types of caimito, the purple and the green fruited. Both are green when immature but when they ripen, the first one (purple type) turns purple (Fig. 4) while the other one (green type) remains green or changes to yellowish-green (Fig. 5).

There are two varieties of caimito in the Philippines registered in the National Seed Council (NSIC), the RCF Purple (NSIC 1995 Cm 01) which originated from seed of unknown source by Dr. Roberto E. Coronel of Los Baños, Laguna and the Rabanal (NSIC 2000 Cm 02) which originated from seedling by Mr. Sixto R. Pascua of Batac, Ilocos Norte (Fig. 6 & 7). Both varieties are generally characterized to have fruitful trees with large purple and delicious fruits and easy to propagate by cleft grafting.

Table 2. Morphological and horticultural characteristics of RCF Purple and Rabanal caimito varieties.

Characteristics	Variety	
	RCF Purple	Rabanal
Tree		
Age (year)	35-40	53
Height (m)	10	20
Growth habit	spreading	spreading
Growth and vigor	strong	strong
Fruiting season	January-February	March-May
Regularity of bearing	annual	regular
Yield (fruits/year)	2,000-2,500	1,000
Whole Fruit		
Size		
Weight (g)	331.4	379.7
Length (cm)	8.3	8.8
Width (cm)	8.5	8
Shape	globose	globose

Skin		
Color	purple	purple
Texture	Smooth and shiny	Smooth and shiny
Thickness (mm)	7.9	3.7
Weight (g)	153	106.4
Flesh		: 69.6%
Color	creamy white to purple	creamy white to purple
Texture	soft and melting	smooth and fine
Juiciness	Juicy	Juicy
Fibers	None	none to scanty
Aroma	mild	mild
TSS (°Brix)	13.2	18.9
Flavor	sweet and creamy	very sweet and creamy
Edible portion (%)	51.1	69.6
Seed		
Number	6.8	7.5
Size		
Weight (g)	8.2	8.8
Length (cm)	2.3	2.3
Width (cm)	1.6	1.5
Shape	flat	flat
Color		black

Culture and Management

Soil and Climatic Requirements

The caimito grows successfully on almost any type of soil. It can grow in shallow sandy soils or in poorly drained clay soils. For best performance, a deep, fertile and well drained soil is preferred. A slightly acidic soil condition (pH 5.5-6.0) is desirable.

The caimito is a hardy plant and thrives well on almost all types of climate in the Philippines. It thrives best in warm and humid places at low and medium altitudes where the dry season is not very pronounced. In places with prolonged dry season, the tree suffers from water stress as evidenced by the wilting and abscission of leaves. The fruit shrivel and become less juicy upon ripening.

Seed Preparation and Germination

Select seeds from healthy, sound and ripe fruits. Extract, washed thoroughly with water and sow in seed boxes or seedbeds containing garden soil mixed with coir dust. Plant the seeds about 1 cm deep and about 2-3 cm apart and water regularly to

keep the seedbed moist all the time. The seed will germinate in 18-40 days after sowing. The seedbed should be located in a partially shaded area to protect the seeds and the emerging seedling from injury due to direct exposure to sunlight.

The caimito seeds can be stored after cleaning for some time and retain their viability by allowing them to air-dry for a couple of days, stirring them now and then to ensure uniform drying and then store in clean, dry containers until planting time.

Establishment and Care of Seedlings

When 3-5 leaves have developed, transplant the seedlings individually in a 7 x 11" polyethylene bags containing a mixture of 70% garden soil + 30% organic matter or compost as potting/bagging medium to hasten growth of seedlings. Make sure that the bags have small holes at the bottom to drain excess water. Provide partial shade to newly bagged seedlings until such time they are already established. Regular watering and spraying with fungicide and insecticides is necessary to protect the seedlings against pests and diseases. They can be used as rootstock after 6-8 months.

Propagation

Caimito may be propagated sexually by seeds and asexually by marcotting, inarching, grafting and budding.

Apparently, a tree propagated by seeds exhibit a high degree of variability with respect to plant and fruit characters; take a longer time to bear fruits; and tend to grow into a large tree. Whereas in an asexually propagated tree, the genetic make up of the tree is known or its true varietal identity is evident; bears fruits early; and the tree size is smaller than a sexually propagated tree. Thus, asexual propagation is recommended to multiply outstanding trees.

Cleft grafting is the commonly used method of asexual propagation by fruit growers and nursery operators. It has been used successfully not only to propagate outstanding caimito trees but also to transform undesirable trees to desirable varieties. This is a method of plant propagation by which a healthy shoot called scion or budstick is taken from a selected mother tree and then inserted into a healthy rootstock to grow together as one plant. The scion and rootstock must be compatible for them to unite permanently.

Steps in cleft grafting:

1. Chose a healthy seedling rootstock about 6-8 months old or 7-10 mm in stem diameter.

2. Cut off the shoot of the rootstock and make a vertical cut about 2.0 – 2.5 cm. to make a V-shaped opening for the scion.
3. Get a scion from selected outstanding tree with stem size approximately matching that of the rootstock.
4. Cut the basal end of the scion into a gently sloping wedge about 2 cm. long.
5. Insert the scion onto the opening of the rootstock.
6. Wrap the graft union and the budstick with thin plastic strip and cover with ice candy wrapper.

Complete union of the scion and the rootstocks is attained after 21 days and within 7 months after grafting, the grafted plants are large enough and ready for transplanting.

Land Preparation and Planting

Clear the land before laying out. Plow deeply and harrow twice to attain good soil tilth. Lay-out stakes at 10 m between rows and 12 m between hills. Dig holes on places occupied by the stakes. Prior to planting, put at least 500 g to 1 kg organic fertilizer or animal manure in each hole. Plant at the onset of rainy season. At planting, remove the bag or container of the planting material and gently set in the prepared holes, then cover with top soil which is then pressed firmly around the stem. The plant material should be matured with no signs of flushing to avoid planting shock due to exposure to sunlight. Water immediately the newly transplanted trees and provide temporary shade in case dry period will come after planting.

Intercropping and Covercropping

Utilize fully the spaces between the rows of caimito trees while they are not yet productive by planting cash crops such as corn, pineapple, root crops and vegetable crops to provide shade, added income, and minimize the growth of weeds. Other fruit trees and plantation crops such as banana, lanzones, rambutan, coffee and cacao may also be utilized as intercrops.

Growing of perennial leguminous crops between caimito trees is beneficial for they serve as source of nutrients as they decompose enriching the soil with nitrogen and humus, they control growth of weeds and soil erosion.

Irrigation

Water is necessary for newly planted caimito trees to ensure survival and uninterrupted growth. Water the plants regularly during long dry period especially

when trees are on flowering and fruit development stages to prevent flower and fruit abscission. The fruit quality especially its juiciness will also be affected if water is inadequate.

Fertilization

Soil analysis is necessary to know the fertilizer requirement of the caimito trees. However, in the absence of soil analysis, the general fertilization practice to ensure the healthy growth of young caimito trees, nitrogen with phosphorous fertilizer should be applied. Organic fertilizer can also supplement the nutritional needs of the plants. Do basal fertilization with 0.5-1 kg of chicken or cow manure. For non-bearing trees, apply 150-200 g Ammonium Phosphate (16-20-0) twice a year. When the tree is about to flower, apply twice a year 500 g complete fertilizer with high nitrogen and potassium to promote yield, size and quality of fruits. For full grown trees, about 3 kg or more complete fertilizer may be applied in two split application.

Training and Pruning

When the trees are still young or approximately one meter tall, pruning should be done to train them to a desirable height and shape of the canopy. This is done by allowing only 2-3 primary branches to develop the secondary branches that will form the desired canopy shape. Once the trees have attained their workable height and shape, maintain the trees by regular pruning and removal of water sprouts and infested twigs to allow penetration of sunlight and air circulation within the canopy and prevent the emergence of pests and diseases.

Control of Pests

The common pests that attack the fruit are as follows: twig borers, carpenter moth, mealy bugs, scales, fruit flies, ants and bats. This pest can be controlled by chemical application except for bats that are nocturnal and can be waylaid off by scarecrows like hanging of colored plastic bags on bearing branches.

Control of Diseases

Considering that caimito is a sturdy tree, the fruit is resistant to diseases. There is no common disease in fruits except for sooty soft rot which can be controlled by contact fungicide, and can be prevented by sanitation and pruning.

Harvesting

Caimito trees start to bear fruits at the age of 5-6 years for seedling trees while grafted trees flower as early as 3-4 years. The flowering starts in the month of June to December and harvesting is from late December to March or April. Full grown trees usually bear 1,000 fruits per tree depending on the season, locality and the management practices.

For evergreen varieties, the fruit is ripe when it changes its color from dull green to light green and the purple variety, from dull green to purple. Usually the ripe fruits are soft when slightly pressed by hand. Ripe fruits should not be left in the tree longer than necessary for they are attacked by fruitflies, birds and bats.

Caimito fruits do not ripen at the same time, so selective harvesting is done. Harvest the fruits manually by climbing the tree or using a ladder. Pick the fruits by cutting the pedicel or stem to avoid wounding the base of the pedicel and prevent early rotting of fruit. For fruits that cannot be reached by hand, use bamboo pole with net attached to catch the fruits. Pick only the ripe fruits for those harvested unripe will never turn ripe. Place harvested fruits in a basket attached to a rope which is then lowered down to the ground once filled-up.

Sort harvested fruits on the ground and separate damaged fruits. Clip off the stem so as not to leave a stub that may injure other fruits. Pack fruits in bamboo baskets, kaings or boxes lined with banana leaves. Dispose or market immediately for the fruits are highly perishable.

Cost and Return

Tables 3 and 4 show the estimated volume of production and the ten-year estimated cost and return of a one-hectare caimito orchard, respectively. It is also shown in Appendix 1a and Appendix 1b the estimated costs of production of planting materials and the estimated establishment and management costs of a one-hectare caimito orchard for a period of ten years.

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