

Tropical Tree SEED MANUAL

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ACKNOWLEDGEMENT

The *Tropical Tree Seed Manual* (TTSM) is the product of international cooperation and contributions. In 1990, the members of the North American Forestry Commission of the United Nations Food and Agriculture Organization authorized compilation of a tropical tree seed reference manual for use among its membership in Canada, the United States, and Mexico. Under the direction of Dr. Whitmore, USDA Forest Service (Forest Service), the project was later expanded to include tropical tree species found in all of tropical America from Canada to Colombia. Since work on the project began in April 1996, 63 scientists from 19 countries have responded by providing species descriptions, chapters, translations, drawings, herbarium specimens, and references both unpublished and published.

The Forest Service supported the project by permitting employees to establish international contacts, compile the data, and oversee production and by funding the botanical drawings, Spanish-English translations, operations, editing, and printing of the English edition. Specifically, I want to thank the National Reforestation, Nurseries, and Genetic Resources (RNGR) Team and the Washington Office Cooperative Forestry group for their support with the English-Spanish translations. I value the advice and counsel of Dr. George Hernandez, Dr. Tom Landis, and Dr. Ron Overton of the Forest Service.

The TTSM would not have been produced without the help of all of these people. My sincere gratitude goes especially to Dr. James M. Guldin, USFS; the Red de Herbarium de Mesoamerica y el Caribe, particularly Dr. Mireya Correa A. Lic. AnaLu E. de MacVean; Dr. Cyril Hardy Nelson Sutherland; Dr. Ricardo Rueda; and M.Sc. Jeanine Velez Gavilan. I thank Gustavo Serrano for the original botanical drawings of all species, and Francisco Hodgson for the illustrations in Chapter 1. Special thanks to Maria Arun Kumar for her patience with the Spanish-English translations, and to Brenda Grebner for the draft and final versions of all submissions. I also thank Pamela Bowman, a technical editor with the Forest Service, Sonja Beavers, Mary Jane Senter, USFS, and George Avalos, USDA for their invaluable comments and suggestions. Dr. K.F. Connor and Mrs. Penny Byler made available additional Forest Service resources to complete this project.

Dr. Rosa Elena Molina Achecar de Vozzo warrants special mention for her many hours of patience, cooperation, and translations...all volunteered.

The greatest fault of this manual will not be misspelled words, unintentionally erroneous data reports, or negligent omissions. It will be my inability to acknowledge all the people and institutes who helped make TTSM possible.

A. Vozzo

Research Plant Physiologist

Byrsonima crassifolia (L.) Kunth

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University of Panama and
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MALPIGHIACEAE THE BARBADOS CHERRY FAMILY)

Malpighia crassifolia L., *Byrsonima pulchra* Sessé and Mocino ex DC., *Byrsonima cumingana* Juss.,
Byrsonima fendleri Turcz., *Byrsonima panamensis* Beurl., *Malpighia pulchra* Sessé and Moç.

Maricao cimarrón, changugo, chaparro, chaparro de sabana, chaparro manteca, chaparro manteco, chi, craboo, crabo, crapoo, doncela, hori, huria, manero, manteco, manteco merey, maricao, maricao verde, nance, nance agrio, nance verde, nanche, nancite, nancito, peraleja' noro, peralejo, peralejo blanco, peralejo de sabana, sabana kwari moeidan, sabana mango, savanna serrette, tapal, wild-cherry, wild craboo, yuco (Little and Wadsworth 1964)

The genus *Byrsonima* has approximately 130 species native to tropical America (Mabberley 1997). *Byrsonima crassifolia* is found from Veracruz in Mexico to Brazil and Paraguay; it also grows in the West Indies. The species, often used as an ornamental, has been introduced to southern Florida (Little and Wadsworth 1964). The species is amply distributed and ecologically variable. *Byrsonima crassifolia* generally grows in association with *Curatella americana* L. (chumico) and both species are resistant to fire, displaying a special habit that makes the trees appear twisted (Anderson 1983).

Byrsonima crassifolia is a small evergreen tree, 4 to 10 m in height and 15 to 30 cm d.b.h. The tree has a fissured bark, gray to dark chocolate in color, with lenticels. The interior part has pink or red grooves and a bitter taste. The stems have prominent foliar scars, and young leaves are tomentose. The leaves are opposite, obovate to elliptic or ovate, scantily acuminate, 4 to 15 cm long, and 2 to 9 cm wide with an acute to obtuse base and whole margin. Found in wet tropical, dry tropical, premountain, and very wet tropical forests, the species usually grows in barren soils of dry to very wet places and is common in savannas and pastures (Holdridge 1970). Annual precipitation in these life zones ranges between 1000 and 8000 mm; minimum average annual temperature is 17 °C and maximum is 27 °C (Holdridge and others 1971). *Byrsonima crassifolia* is found at elevations up to 1500 m and grows in acidic and poor soils (Geilfus 1994).

Byrsonima crassifolia is a most variable species, especially in leaf size, leaf shape, and indumentum density (Cuatrecasas and Croat 1980). The ovary is usually glabrous; however,

in some specimens it is hairy. According to these authors, the absence of a connection in the variation of the previous characteristics does not allow the recognition of subspecies. However, Geilfus (1994) reports that Brazilians distinguish five varieties according to the color of the fruit (white, red, orange, and green) and its size (larger than usual). No hybrids or geographic races have been reported.

The wood of *B. crassifolia* is opaque, reddish chocolate in color, hard, heavy (specific gravity of 0.7), and moderately durable. Throughout its range, every part of the tree is used in a variety of ways. Due to its golden yellow flowers, the tree is used as an ornamental, especially in Florida, and in some countries it is considered a honey-bearing tree. The wood is used for charcoal and firewood. The bark is used to tan hides, poison fish, and treat gastrointestinal and pulmonary diseases and skin infections. The roots are used to treat a variety of illnesses. The fruit may be used as a cotton dye and as a major component in sweet foodstuffs such as jellies and sherbets. Information about uses specific to a given country is presented in the last section of this description.

The species flowers from November through July, primarily from March through June, for approximately 6 weeks. The numerous flowers change from yellow to red-orange as they age. The five sepals are 1.5 to 2.5 mm long, obtuse, recurvate, and internally glabrous; each has two big oblong-ovoid glands. The petals are unguiculate, 10 to 13 mm long, glabrous, suborbicular, with a concave lamina and irregular margin. Usually, one petal is erect and small while the others are divergent to reflexed. The 10 stamens are 4 to 5 mm long,

the base of the filaments is hispid, the anthers are introrse and 2.5 to 3.0 mm long, and the connective is thickened. The ovary has three styles and is usually pubescent, thin, and slightly longer than or equal to the stamens. Trees begin to fruit at 1-1/2 years and maximum yield begins at 4 years. Each tree produces 15 to 20 kilos of fruit during a harvest of 4 to 6 months (Geilfus 1994). One drupe (fruit) is produced from each flower. The drupes are ovate-globose, glabrous, 0.8 to 1.5 cm in diameter, green to reddish-yellow, and acidic. The fruits ripen primarily in August and September and are dispersed by birds (Anderson 1983). The seed is big, measuring approximately 0.5 to 1.2 cm in diameter (Cuatrecasas and Croat 1980).

Fruits are collected from the ground. No special tools are used, and the job is easily done by hand. When branches are not accessible, fruits can be made to fall by throwing a lightweight object, such as a piece of wood, and hitting the branches. Fruits are tightly stuffed into previously cleaned bottles with water and sold this way. Seed can be separated from the fruit with a soft squeezing action of the hand. They can also be left to dry, causing the oily fruit to shrink and expose the seed. The seeds can be preserved for several months in plastic bags that are stored in agave fiber sacks (Vega and others 1983). *Byrsonima crassifolia* seeds collected in Mexico averaged 5,280 per kg (Vega and others 1983).

Soaking or dehydrating the fruit can be considered an unintentional pretreatment that is unnecessary for germination. The species primarily reproduces through seeds, and in Mexico 30 percent of the seeds germinated at 22 days (Vega and others 1983). In current germination studies of *B. crassifolia*, seeds germinated only when given more than 50 percent direct sunlight. Seeds that germinated represented no more than 7 percent of the total planted, and germination took place in 158 to 183 days (Center for Tropical Forest Science, unpublished).

Seeds germinate between 2 and 10 weeks when planted 2 cm deep in seed beds (Geilfus 1994). Seedlings measuring 5 cm in height can be transplanted into bags. In about 2 years, seedlings may reach between 40 and 60 cm and are outplanted. Seedlings should be outplanted with 6 m spacing, and lower branches should be pruned to obtain a uniform crown.

ADDITIONAL INFORMATION

The adaxial surface of the leaf is slightly tomentose or almost glabrous when ripe. The abaxial surface is densely pubescent with pedicellate trichomes or glabrous when mature. The arched middle vein is pubescent even when the leaf is mature. The petioles are thick and 0.5 to 1.5 cm long. Terminal pseudoracemes, which grow up to 20 cm long, are usually isolated and not ramified, sometimes with a few short branches near the base. They are densely pubescent when young and

almost glabrous when mature. The bracts are ovate-lanceolate, 2 to 4 mm long, and deciduous. The bractlets are ovate, acute, and 1.0 to 1.5 mm long, and the pedicels are up to 1.5 cm long (Cuatrecasas and Croat 1980).

In a biological and phytochemical study of the leaves, 22 compounds were isolated, identified, and tested for spasmogenic activity (Bejar and others 1995). Among the major compounds identified were triterpenes, flavonoids, sterols, an aromatic ester, and common and nonprotein amino acids. Bejar and Malone (1993) studied pharmacological and chemical extracts of leaves and bark and found the extracts reduced motor activity and acted as a light analgesic in rats.

The flowers of *B. crassifolia* produce abundant lipids instead of nectar; the lipids are gathered by several bee species of the genus *Centris* (Vinson and others 1997). Bees obtain pollen and the oil from glands located over the sepals in each visit to the flower. Oil is gathered by female bees primarily from the genus *Centris*. The oil is mixed with pollen to feed the larvae. The adult bees feed on the sugary nectar obtained from other species of plants with flowers. Bees from the genus *Trigona* also take the pollen from the flower (Anderson 1983).

Throughout its range, *B. crassifolia* serves in a variety of ways. It provides heat and sustenance and is used to treat a number of human illnesses. In America, the use of this species is quite ancient. Carbonized seeds, residues of the stem, and charcoal originating from 2,000 to 1,000 B.C. have been found in the area of Cuello in northern Belize (Turner and Miksicek 1984).

In Central America, the fruits are sold in bottles filled with water and used to make cold drinks, jellies, and other sweets. These fruits contain 90 to 240 mg per 100 g of vitamin C (Rehm and Espig 1991). Sometimes, the cold drinks are frozen and eaten as ice cream or sherbet, and butter is extracted from the fruits by soaking in hot water (Duke 1986). Both domesticated and wild animals eat the fruits. In addition, the bark is used to poison fish and tan animal hides, and the wood is used for charcoal and firewood and to obtain a red coloring used to treat skin diseases (Duke 1986). The epidermis of the plant and the unripe fruits are used to dye cotton.

In Guatemala, the peel of the fruit produces a light chocolate-colored coloring, which is used to dye cotton fabrics. It has also been reported to be a honey-bearing plant and, in some countries, the bark is used in tannery processes and in household remedies. A decoction of the dry bark is used to treat asthma, bronchitis, colds, coughs, fevers, tonsillitis, and skin infections (Cáceres and others 1993). The extract in hot water is used externally to treat mucous lesions and skin diseases caused by fungi (Cáceres and others 1991).

In Honduras, an infusion of the bark is used to treat diarrhea, discharges, wounds, skin diseases, toothaches, stomach aches, and oral disease (House and others 1995). Members

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of the Amerindian group Jicaque, located in the center of Honduras, eat the fruits uncooked or in drinks (Lentz 1985). In Nicaragua, the leaves and bark are used to treat diarrhea and the bark is ground in water and applied directly to the skin to treat measles (Barrett 1994). In Costa Rica, an infusion of the bark is used to treat chest colds (Pittier 1957). In Panama, the fresh bark is soaked in water for 24 hours, and the extract administered to treat chronic colitis and pyorrhea; the water, after the decoction of the bark, is administered as a diuretic (Gupta and others 1979).

In the Neotropics, this species is widely used for medicinal purposes. In Mexico, a decoction of the dry bark is used to treat snake bites and fever and to expel the placenta and reduce bleeding in women during childbirth (Bejar and Malone 1993). An infusion of the bark is administered to treat diar-

rhea and dysentery, and water from a decoction of dry branches is administered to treat bad coughs (Zamora-Martinez and Pola 1992). The liquid obtained from the decoction of leaves and dry roots is taken to treat diarrhea, to expel the placenta, and to reduce fevers (Bejar and Malone 1993). The dry fruit is also used to treat fever (Bejar and Malone 1993). The Mixe Indians from Oaxaca, Mexico use the bark to treat gastrointestinal disorders and skin infections (Geiss and others 1995).

In Colombia, the bark is used to treat diarrhea because it contains tannins (García Barriga 1992). It is also considered a good astringent and fever reducer. A decoction of the bark is used as a snake bite antidote. In Brazil, the fresh plant in water is used to treat dysmenorrhea, aches, weakness, and intense bleeding (Elisabetsky and Posey 1989). In Venezuela, Lewis and Elvin-Lewis (1977) reported that the bark is used as a fish poison.

