

TROPICAL FRUITS and Other Edible Plants OF THE WORLD

AN ILLUSTRATED GUIDE



ROLF BLANCHE

Tropical Fruits
and Other Edible Plants
of the World



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An Illustrated Guide

ROLF BLANCHE

A Zona Tropical Publication
FROM
Comstock Publishing Associates
a division of
Cornell University Press
Ithaca and London

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First published 2016 by Cornell University Press

Printed in China

Library of Congress Cataloging-in-Publication Data

Names: Blancke, Rolf, author.

Title: Tropical fruits and other edible plants of the world : an illustrated guide / Rolf Blancke.

Description: Ithaca : Comstock Publishing Associates, a division of Cornell University Press, 2016. | "A Zona Tropical publication." | Includes bibliographical references and index.

Identifiers: LCCN 2015046151 | ISBN 9780801454172 (cloth : alk. paper)

Subjects: LCSH: Tropical fruit—Identification. | Plants, Edible—Tropics—Identification.

Classification: LCC SB359 .B53 2016 | DDC 634/.6—dc23

LC record available at <http://lcn.loc.gov/2015046151>

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Cloth printing 10 9 8 7 6 5 4 3 2 1

Book design: Gabriela Wattson

Cover design: George Whipple

To my wife, Juana, and my parents, Elke and Horst

CONTENTS

Introduction.....	1
1. Fruits.....	7
2. Palms.....	243
3. Tubers.....	258
4. Spices and Herbs.....	275
Glossary.....	315
Bibliography.....	319
Acknowledgments.....	323
Kickstarter Donors.....	325
Photo Credits.....	327
Index.....	329
About the Author.....	339



INTRODUCTION

Each year millions of people travel to tropical destinations, where they come into contact with exotic fruits, tubers, and spices, either in local markets, along country roads, or in the dishes they eat. But even at home, global commerce and migration have made tropical food products, which decades ago were virtually unknown outside the tropics, relatively easy to find. And those living in tropical regions are ever more likely to find tropical fruits from distant tropical countries in their local supermarkets. This new, year-round availability of tropical foods offers a wealth of possibilities for those who want to try out new foods, expand their culinary skills, or incorporate healthier foods into their diet.

The tropical regions are home to a vast variety of edible fruits and other plants. Of the more than 2,000 species that are commonly used as food in the tropics, only about 40 to 50 species are well known internationally, and, of these, only a few species—banana, mango, papaya, and pineapple, for example—are of significant commercial importance. This book illustrates and describes more than 300 species of tropical (and subtropical) species of fruit, palm, tuber, and spices. Besides describing all the common species, the author also includes many lesser known species such as mangosteen, maca, and soursop, as well as rare species like engkala, sundrop, and maprang. While some rare species will never gain popular acceptance—either because they are an acquired taste, contain too little pulp, or don't ship well—many are likely to become popular internationally, and some will become commercially important.

In each of the four chapters—fruits, palms, tubers, and spices and herbs—species appear in alphabetical order, arranged according to scientific name. In some cases, a plant could plausibly fit into more than one chapter. Cacao, for instance, is used both as a spice (the seeds) and as a culinary fruit (the pulp); since it is most commonly used as a spice, however, it has been placed in that chapter. A few species have been placed in the fruit chapter even though their edible parts (leaves or flowers, for example) are not, in botanical terms, fruits; in such cases, the author placed the species in the fruit chapter simply because it seemed the closest fit.

While the difference between a fruit and vegetable is a matter of common sense to the general reader, a few words of clarification are in order. To botanists, a fruit is the part of a flowering plant that develops from a fertilized flower into tissues that bear the seeds necessary for reproduction. This means that mangos, zucchinis, chilies, cucumbers, and tomatoes are all fruits. In a botanical sense, vegetables might best be classified as non-reproductive plant parts such as leaves, petioles, buds, shoots, and roots that are used as food. In a culinary sense, however, fruits are plant parts that are fleshy and sweet, whereas vegetables are plant parts that are not sweet. Fruits are commonly eaten raw or cooked to make desserts and other sweet dishes. Vegetables are mainly used for the preparation of savory dishes. In botanical terms, most nuts and grains are fruits.

Nomenclature

In 1753, Carl Linnaeus published his binominal classification system for plants, *Species Plantarum*, which relied on Latin names. Since then, over 1,200,000 plant names have been assigned to more than 400,000 species of flowering plants. Often, a given species gets a new scientific name because of new scientific evidence and advances in botanical classification. To avoid confusion, all plants mentioned in this book use the binominal scientific name and family name according to Tropicos® (www.tropicos.org), published by the Missouri Botanical Garden.

While each species of fruit has a single unique scientific name, many have dozens of common names, in a variety of languages. And, to make matters more confusing, the same common name is often applied to more than one species. In this book, for each species the author gives one or two of the most frequently used English common names. Local names are not included except in a few cases in which the local name has become internationally accepted; since many plants are grown throughout the tropics, a given species sometimes has literally hundreds of different local names. It would simply be impossible to list each and every one.

Tropical Regions

The tropics are a region along the equator that is delimited to the north by the Tropic of Cancer (23°26'N) and to the south by the Tropic of Capricorn (23°26'S). The climate is generally characterized by constantly warm temperatures averaging 25 to 27 °C (77 to 81 °F), with little variation from day to night or season to season. But the climate does vary in other ways; in some regions such as Southeast Asia there is a rainy season and



Agricultural workers harvesting pineapples on a plantation, ca. 1920, Hawaii.



Date palms festooned with ripe fruits, northern Israel.

a dry season, with dramatic fluctuations in precipitation. The tropics also include arid and semiarid climates, with relatively little rain and dry forest or savannah vegetation. In addition to the differences in precipitation, there is also an altitudinal change in temperature from sea level to snow peaked mountain in the Andes, eastern Africa, and the Himalayas.

Differences in temperature and in the timing and amount of rainfall result in distinct life zones. Regions with constantly high temperatures and year-round rainfalls usually have rainforests. Regions with distinct rainy seasons have seasonally deciduous forests or, in tropical Asia, monsoon forests. Arid and semiarid areas have dry forests, savannahs, or even deserts. Such diversity in temperatures and precipitation leads to a diversity of ecosystems that in part explains the astonishing diversity of edible plant species to be found in tropical climates.

Species Accounts

Each species account includes a range map to show the approximate native range of the plant. This is by no means exact. Fruits, seeds, plants, and plant parts have been traded and transported by humans since antiquity. And as people began carrying plant species from place to place, they also changed the original natural habitats of a given species, through agriculture and other human activities. Thousands of years ago, early sailors took the breadfruit from its native habitat in the South Pacific and spread it from island to island throughout Southeast Asia. Pineapple and tomato, both from South America, had been cultivated in Central America for centuries by the time Columbus arrived in 1492. Arab traders brought Asian citrus species and spices to the Mediterranean region.



Tea plantation in Cameron Highlands, Malaysia.

In colonial times, fruits like the pineapple were brought from colonies in the Americas back to the Old World, in this case Spain, and then transported to yet other colonies in the tropics. For these and other reasons, it is often nearly impossible to trace the exact native range of a food plant.

Each species includes one or two photographs, showing the plant with its fruits, flowers, or other edible parts. In addition to maps and photographs, the species accounts contain the following elements:

Description. For each species, the author includes a short botanical description to help identify the plant. While many of the botanical terms are explained in the glossary, this section is likely to be of greatest use for botanists.

Origin and Distribution. This section provides a short natural history of the species described. It focuses on its natural distribution, its domestication, and the extent to which humans have spread the plant beyond its original range. This section also often includes a description of the plant's preferred climate.

Food uses. All plants described in this book are used as food. Many fruits, palms, tubers, and spices and herbs are used in a countless number of ways. This section mentions the most common ways each fruit or vegetable is used. It often also describes unusual and lesser known ways a fruit is used; the cacao fruit, for example, contains the seeds used to make chocolate, but also provides a white, sweet pulp used in some places to make milk shakes.

Comments. This section is a potpourri, with all kinds of interesting information, on nutrition, medicinal use, origin of name, and related species.

Where to Find Tropical Fruits

The obvious and easiest way to find tropical fruits and other edible plants is to go to markets. Fortunately, even people who do not live in tropical countries are ever more likely to find tropical fruits in their local supermarket.

A second good option is to visit tropical botanical gardens, some of which have a special section for tropical fruit trees. A few famous examples are the Singapore Botanic Gardens, the Rio de Janeiro Botanical Garden, and Fairchild Tropical Botanic Garden, in Miami, Florida.

A third option is to visit private collections. Throughout the tropics people have started their own collections of exotic fruit trees and some are open to the public. Two better known private collections are the Tropical Fruit Farm, in Penang, Malaysia, and the Fruit & Spice Park, in Miami, Florida. The author, who lives in Puerto Viejo, Costa Rica, has a collection of more than 150 species of tropical fruits and exotic spices.



Fruits and vegetables on sale at Amphawa floating market, Bangkok, Thailand.

1

Fruits

Many tropical trees, bushes, and vines produce edible fruits. Although all are botanically fruits, it is largely their culinary use that determines whether they are classified as fruits or vegetables. Some plants like the mango (*Mangifera indica*) or the jackfruit (*Artocarpus heterophyllus*) are served fully ripe as a fruit and unripe as a vegetable.

For a long time now, dozens of species of tropical fruit—including bananas, mangos, and pineapples—have been popular outside of the tropics. But in recent years, many new species like the longan (*Dimocarpus longan*) and the litchi (*Litchi sinensis*) have grown in popularity in temperate regions. Even so, there are still many lesser known fruits that are rarely exported and used almost exclusively in tropical countries. The soursop (*Annona muricata*) is a good example. Although it is delicious, it is too soft and bulky to be transported over long distances.

Other tasty fruits like the peach palm (*Bactris gasipaes*) and the engkala (*Litsea garciae*) are so little known that an international market for them has yet to develop. This chapter, which presents 235 species of tropical fruit, will hopefully introduce readers to many new wonderful foods.



Abelmoschus esculentus (L.) Moench

OKRA, GUMBO

Malvaceae (Mallow family)

Description. Okra is an annual herbaceous plant with partly woody stems, 1.5–2 m (5–7 ft) tall. Alternate leaves are spirally arranged around branches. Blades ovate, 12–22 cm (5–9 in) long with 5–7 shallow lobes. Bright yellow flowers with a brownish-red spot at the base of each petal are borne singly in the axils of the upper leaves. Fruits are erect, 15–40 cm (6–16 in) long, often beaked capsules with longitudinal ridges and numerous hard, dark green or dark brown seeds. Unripe green fruits contain a mucilaginous sap, whereas ripe fruits are dry and light brown in color.

Origin and Distribution. The exact origin of okra is not known. The plant is probably native to tropical Africa, India, or Southeast Asia, where wild *Abelmoschus* species have the highest species diversity. Recent genetic research indicates that the crop might comprise multiple species of African and Asian origin. Okra is an ancient crop that was already being cultivated in Egypt around 2000 BC. Today the crop is widely grown as an annual vegetable throughout the tropics and subtropics and in warm temperate climates.

The cultivation of okra requires relatively little attention because of its natural resistance to drought, pests, and diseases. It is often grown in home gardens but also in extensive plantations. Main producers of okra are India, Pakistan, Iraq, and Ghana.

Food uses. The unripe fruit pods, which have a mild taste, are eaten as a vegetable in many regions of the world. They are usually boiled or stir-fried whole or in

slices and served as a side dish, used in soups and stews, or cooked or fried with meat and other vegetables. The mucilaginous sap contains a soluble fiber used as a thickener in soups. Cooking or frying with vinegar or a sprinkle of lime reduces sliminess. Okra is an important ingredient in a traditional meat or seafood stew known as gumbo, a dish typical of the Gulf Coast of the United States. In India and Pakistan, okra slices are often fried with meat and spices or salted and pickled. Less often okra is eaten raw in salads. Unripe okra fruits can be dried for later use. The leaves and young shoots are edible and cooked as a vegetable similar to spinach or eaten raw in salads.

Comments. Okra is a vegetable low in calories but a good source of vitamin C, provitamin A, and the minerals calcium, magnesium, and potassium. The high content of mucilaginous sap makes the fruit ideal for people with stomach ailments. The seeds contain a greenish-yellow oil high in unsaturated fats. The high-quality oil, called ambretta, is used in the food and perfume industry and as a therapeutic oil. In times when coffee wasn't readily available, the seeds were roasted, ground, and used as a coffee substitute.



Unripe fruits are green.



Actinidia chinensis var. *deliciosa* (A. Chev.) A. Chev.

KIWIFRUIT

Actinidiaceae (Chinese gooseberry family)



This fruit is also known as Chinese gooseberry. Note that the skin of the golden variety is smoother than that of the green variety.

Description. The kiwifruit grows on a perennial, deciduous vine with branches up to 10 m (33 ft) long covered in short reddish-brown hairs. Opposite, cordate leaves 8–15 cm (3–6 in) long with long petioles and finely toothed leaf margins. Monoecious, fragrant white flowers are borne in small clusters in axils of leaves. Fruits ovate, olive-green berries 4–6 cm (1.6–2.4 in) long, with a thin skin covered in short brown hairs. The green to greenish-yellow, juicy and sweet to subacid flesh contains numerous tiny black seeds.

Origin and Distribution. Native to southern China, where the vine grows naturally in a subtropical or warm temperate climate. Widely cultivated for its fruits. Today the main producer of kiwifruits is Italy, followed by New Zealand and Chile.

Food uses. Ripe fruits are commonly eaten out of hand or used in fruit salads. They are also made into marmalade and juice. Kiwifruits are served as appetizers, in salads, or in fish, chicken, and meat dishes. Slices are used as garnish for cocktails, ice cream, desserts, and cakes. Slightly underripe fruits are

used for preparing chutneys and jellies. Overripe fruits are fermented to produce a winelike, alcoholic drink.

Comments. Fruits are a very good source of vitamin C, with one fruit providing the daily requirement of an adult. Kiwifruits contain the proteolytic enzyme actinidin, which can be used to tenderize meat.

The popular and most widely planted variety, *A. chinensis* 'Hayward', was initially created in New Zealand in 1924. In 1959, mainly for marketing reasons, this variety was named kiwi after New Zealand's national bird.



Aegle marmelos (L.) Corrêa

BAEL FRUIT

Rutaceae (Citrus family)



Fruits turn yellowish or reddish when fully ripe.

Description. Medium-sized deciduous tree, 14–18 m (46–59 ft) tall, with a short trunk and stiff, spreading branches covered in sharp spines. Alternate leaves with 3–5 oval leaflets with finely toothed margins. Each leaflet is 4–10 cm (1.6–4 in) long by 2–5 cm (0.8–2 in) wide. Fragrant flowers are produced in small clusters on young branches. The fleshy flower petals are greenish on the outside and yellow inside. Woody, spherical to oval or pyriform, hard-shelled fruits measure 8–20 cm (3–8 in) in diameter. Green fruits turn yellowish or reddish when fully ripe. The inside of the fruit consists of 10–20 segments containing an orange, astringent, sour to fairly sweet pulp, which is very aromatic and fragrant and contains several oblong seeds.

Origin and Distribution. Native to a region ranging from Pakistan, central and southern India, Myanmar, and Bangladesh to Vietnam, Cambodia, and Thailand. The tree grows in tropical and subtropical dry forests of lowlands and foothills. It is particularly common in India, where the tree is considered sacred. It is often found in temple gardens or as a dooryard tree. It is rarely grown commercially.

Food uses. The pulp of bael fruit is eaten fresh after the hard shell is broken open. In Indonesia, the sweetened pulp is eaten as dessert. The pulp is often made into a drink similar to lemonade by mixing with water, ice, and sugar. This drink, called *bael ka sharbat* in India, is popular for its cooling effect. The pulp is also used to make sweets, jams, and pickles. Leaves and young shoots are eaten as vegetables in salads.

Comments. In Hinduism, the bael fruit is sacred and used in worship of Lord Shiva. The trifoliate leaf represents the 3-pronged trident held by Shiva that symbolizes the three fundamental powers of will, action, and knowledge. In Nepal, the fruit is used in fertility rituals for girls. The fruits have been used in traditional medicine to treat digestive disorders, as a tonic, and as a mild laxative, among many other purposes.



Aleurites moluccana (L.) Willd.

CANDLENUT

Euphorbiaceae (Spurge family)



Fruits can be either oval or round.

Description. Candlenut is an evergreen tree, 10–25 m (33–82 ft) tall with pyramidal crown and spreading branches. Alternate, pale green, long-petioled leaves 10–20 cm (4–8 in) long, elliptic to ovate or lobed with 3–5 pointed lobes. Small white flowers are produced in terminal panicles. Round or oval fruits 5–8 cm (2–3 in) in diameter with a hard, rough shell and 1 or 2 oily white seeds inside.

Origin and Distribution. The tree is probably native to a vast region from India, Sri Lanka, and Southeast Asia to northern Australia. The exact origin of this tree is unknown because of its early spread by humans. Cultivated throughout tropical Asia and Oceania, often as an ornamental.

Food uses. The oil-rich seeds, slightly toxic when raw, must be boiled or roasted before consumption. They are used in a variety of dishes, especially in Malaysia and Indonesia. In Java, the boiled seeds are ground to make a sauce eaten with rice and vegetables. Roasted and crushed candlenuts are an important ingredient that adds a characteristic taste to *poke*, a raw fish salad served as an appetizer in Hawaiian cuisine.

Comments. Seeds contain about 63% fat, 19% protein, and 8% carbohydrate.

The oil has been used for millennia as fuel for illumination. To make candles, the oily nuts were crushed, mixed with kapok fibers, and mounted on a split bamboo pole. The oil is also important in traditional medicine, used mainly as a laxative and to treat headaches, fever, and diarrhea and to stimulate hair growth. It is also employed in the manufacture of paints and varnishes and as a wood preservative.

The closely related species *A. fordii* (tung tree), native to southern China, Myanmar, and Vietnam, provides an oil used in the production of resins, paints, and grease.



Alibertia edulis (Rich.) A. Rich. ex DC.

PURUI, MARMELADA

Rubiaceae (Coffee family)



Description. Purui is an evergreen shrub or small tree, 4–6 m (13–20 ft) tall, with stiff horizontal branches. Opposite, dark green, glabrous leaves with interpetiolar stipules. Blades lanceolate to oblong-elliptic, 12–22 cm (5–9 in) long by 3–6 cm (1.2–2.4 in) wide, with pointed apex. Cream-white unisexual flowers with 4–5 pointed petals are produced in terminal inflorescences. Fruit a globose, yellow-green to yellow berry measuring 2–4 cm (0.8–1.6 in) in diameter, turning blackish-brown to black when fully ripe. The soft gray pulp has an aromatic, sweet-sour taste and contains numerous small flat seeds.

Origin and Distribution. Native to tropical America, from southern Mexico and Cuba south to Brazil and

Bolivia. The tree, which fruits and flowers most of the year, grows in wet lowland tropical rainforest and premontane forests as well as in seasonal forests with a distinct dry season. It is rarely cultivated and fruits are usually collected from wild trees.

Food uses. The fully ripe fruits are sometimes eaten out of hand. More often the pulp is made into marmalade or jellies. In Brazil, the fruit is used to make ice cream, sweets, desserts, and juices. Ground roasted seeds can be made into a substitute for coffee.

Comments. The common name *purui* means “sweet and sour fruit” in the Tupi-Guarani language of the Tupi tribe of southern Brazil.



Amaranthus caudatus L.

ANDEAN AMARANTH, KIWICHA

Amaranthaceae (Amaranth family)

Description. Fast-growing annual herb, 0.8–2.5 m (2.6–8 ft) tall and irregularly branched with a reddish or purple stem. Simple, alternate leaves elliptic with long petioles. Blades 5–15 cm (2–6 in) long. Small flowers in yellowish, reddish, or purple inflorescences, 0.3–0.9 m (12–35 in) long, that can be erect or become pendent. Black or reddish-brown fruits are spherical to slightly flattened achenes measuring 1–1.5 mm (0.04–0.06 in) in diameter. One plant can produce up to 50,000 seeds. Amaranth is considered a pseudograin, having a grainlike character without belonging botanically to the grass family (Poaceae).

Origin and Distribution. Native to inner-Andean valleys of Ecuador, Peru, Bolivia, and northwestern Argentina, amaranth is one of the most ancient cultivated plants of South America. Remnants of the seeds have been found in excavations dating back more than 4,000 years. Its cultivation was prohibited during the Spanish conquest because the plant, being an integral part of ancient Andean cultures, was used in religious rituals and offerings.

Amaranth is cultivated mostly in inner-Andean valleys at elevations between 1,500 and 3,200 m (4,900–10,500 ft). To a lesser extent, it is also cultivated in the Himalaya regions of India and Nepal.

Food uses. The seeds are rich in starch and protein and used very much like other grains. Amaranth is traditionally an ingredient in soups and stews. The seeds can be ground into flour and used in bakery goods. Amaranth seeds are commonly toasted like popcorn and served as a breakfast cereal or made into granola bars. Amaranth leaves and stems are eaten cooked as a green vegetable.

Comments. This ancient crop, a staple food for most pre-Columbian cultures of South America, has recently become a focal point of interest because of its extraordinary nutritive values. Seeds contain about 30% more protein than most other cereals and are high in essential amino acids like lysine.



They are also rich in vitamins and dietary minerals like iron, magnesium, copper, phosphorus, and manganese. Some scientists consider amaranth the crop of the future. Besides being highly nutritive, it is easy to grow, can withstand droughts, produces a large quantity of seeds, and requires very little fuel to cook with.

Several species of *Amaranthus*, including *A. cruentus*, *A. blitum*, and *A. tricolor*, are cultivated for their leaves. In tropical Asia, the leaves and stems are used as a cooked or steamed vegetable in many savory side dishes or as an ingredient in soups or stir-fries. The roots are also eaten. They are cooked and often served with tamarind, tomatoes, and chili sauce.

Since the plant is not a true grass, amaranth seeds contain no gluten, unlike most other common grains, which are in the family Poaceae.



Anacardium occidentale L.

CASHEW APPLE

Anacardiaceae (Cashew family)

Description. The cashew apple is a small, bushy, evergreen tree, 6–10 m (20–33 ft) tall, often with a twisted trunk. Alternate leaves spirally arranged or in terminal clusters. Blades obovate to oval, 10–20 cm (4–8 in) long by 5–10 cm (2–4 in) wide. Flowers in terminal panicles 15–25 cm (6–10 in) long. Each flower small, reddish with 5 pointed petals. Fruits are the well-known cashew nuts, which are botanically drupes. The kidney-shaped fruit consists of a double shell that contains an allergenic phenolic acid and an edible seed kernel. The cashew apple, which is botanically a pseudofruit, is formed by the receptacle of the cashew flower. When ripe it forms the red or yellow, pear-shaped, 5–12-cm-long (2–5 in) cashew apple, with fibrous, juicy, and astringent pulp. The flavor of the yellow flesh ranges from subacid to fairly sweet.

Origin and Distribution. The cashew apple is native to dry areas of eastern tropical Brazil. It grows naturally in semideciduous and *caatinga* dry forests. In about 1560 the tree was brought to Goa, India, by Portuguese traders. From there it spread to Southeast Asia and Africa.

Food uses. The succulent cashew apple is sometimes eaten fresh but usually made into juice that is very popular in Latin America. The juice is also fermented to produce an aromatic wine. In Goa, the fermented juice is distilled into a brandy called *feni*. The seed kernel, which is produced by removing the toxic shell



The cashew apple is botanically a pseudofruit.

in a complex process, is commonly sold as a snack after being roasted and salted. Seed kernels are also sold sugared or covered with chocolate.

The nuts are used whole or ground in Indian cuisine. They are often made into sauces for savory dishes. In Malaysia, the young leaves are eaten raw in salads.

Comments. Cashew nuts are rich in mono- and polyunsaturated fats and high in dietary minerals like iron, magnesium, phosphorous, and zinc. The cashew apple is a good source of vitamin C. The pseudofruit had been used by indigenous people of South America to produce a brown dye.

The anacardic acid extracted from the shell of the seed shows antibacterial properties. It was used by local tribes to cure sores on feet and hands and to treat tooth infections.





Ananas comosus (L.) Merr.

PINEAPPLE

Bromeliaceae (Pineapple family)

Description. Pineapple is an herbaceous terrestrial plant, 0.5–1.5 m (1.6–5 ft) tall, with very short reduced stem and narrow, elongated, fleshy leaves 60–180 cm (23.6–71 in) long, forming a rosette. Leaves are tipped with a spine and numerous recurved spines on the leaf margins. Varieties grown in plantations are usually spineless. Plants bloom after 18–24 months and die after fruiting. Tubular purple or reddish flowers emerge from an elongated stem, surrounded by bright red leaves and topped by a tuft of short leaves. Compound fruit oval or cone-shaped, 20–35 cm (8–14 in) long, with persistent tuft of stiff leaves on top and waxy yellow, yellow-orange, or yellowish-green rind with hexagonal units. Yellow or whitish flesh juicy, aromatic, subacid to very sweet, usually without seeds, although small hard brown seeds may be present.

Origin and Distribution. Probably native to southern Brazil and Paraguay. The pineapple was cultivated in all of tropical America long before the arrival of the Europeans. It was a staple food and an important part of ceremonies and religious rites. Columbus reportedly saw his first pineapple on the island of Guadeloupe in 1493 and brought fruits back to Europe. For centuries, European horticulturists struggled to grow pineapples in greenhouses. For a long time, the fruit remained a luxury food for the wealthy.

Spaniards and Portuguese introduced the pineapple to their Asian and African colonies early in the sixteenth century. It was introduced into Hawaii in 1813 and the first commercial plantation started there in 1900 by James Dole, soon followed by Del Monte.

Food uses. Pineapples are usually eaten fresh or added to fruit salads, used for juice production, or canned. They are made into sauces, fillings, desserts, and ice cream and cake topping. The juice is part of many mixed drinks and cocktails like the well-known *piña colada*. In tropical Asia, it is an important ingredient in curries and sweet-and-sour meat dishes. In the Philippines, the pulp is fermented and served as *nata de piña*. The young shoots are eaten as a vegetable in various tropical countries.



The Portuguese word *ananas* derives from *nanas*, used by the Tupi Indians of southern Brazil, meaning “excellent fruit.”

Comments. Because of their distant resemblance to pine cones, early Spanish explorers of the seventeenth century called the fruit *piña*.

Pineapple fruits are a good source of manganese, vitamin C, and vitamin B1. They contain the proteolytic enzyme bromelain, which is able to break down protein. It is used as a digestive aid, as a meat tenderizer, and in marinades as well as in medicine and the food industry.

Pineapples are among the commercially most important tropical fruits; the top producers are Thailand and the Philippines. Costa Rica, where the varieties ‘Golden’ and ‘Hawaiian’ are grown, is the largest exporter of fresh fruits. The most commonly grown cultivar is ‘Smooth Cayenne’, with spineless leaves, juicy yellow flesh, and mild flavor.



Annona cherimola Mill.

CHERIMOYA

Annonaceae (Custard apple family)



The delicious pulp of cherimoya has a satiny texture.

Description. Cherimoya is a small, mostly evergreen tree, 5–10 m (16–33 ft) tall with spreading branches. Young branches are covered with fine rust-colored hairs. Alternate, 2-ranked leaves simple, leathery, elliptic to ovate, 8–20 cm (3–8 in) long. Pale green, fleshy flowers with 3 greenish, thick and downy outer petals and 3 smaller and pinkish inner petals. Compound fruits conical or heart-shaped, 10–22 cm (4–9 in) in diameter, skin green with scalelike markings that can be smooth or form small protuberances. Flesh white, juicy with delicious, fruity, subacid to sweet aroma. Fruits contain numerous glossy, hard black seeds.

Origin and Distribution. Native to inter-Andean valleys of Ecuador, Colombia, and Bolivia and possibly Peru, where the tree grows naturally at elevations between 700 and 2,400 m (2,300–7,900 ft). The cherimoya was cultivated in pre-Columbian times and spread very early, before the arrival of the Spanish, to mountainous regions of Central America. European traders took seeds to Africa and Asia, where the tree is cultivated on a small scale. Although tropical in its

origin, it is adapted to higher altitudes with a subtropical or warm-temperate climate, tolerating even light frosts.

Food uses. The fruit is commonly eaten fresh, the pulp being scooped out with a spoon. Fruits halves kept in the freezer can be eaten like ice cream. The seeded pulp is used in fruit salads and for making ice cream, sherbets, and sorbets. Cherimoyas are excellent for making blended juices, milk shakes, and cocktails. The pulp can be fermented to produce an alcoholic beverage with a taste reminiscent of a tropical fruit punch.

Comments. The name *cherimoya* is sometimes wrongly applied to other members of genus *Annona*, including atemoya (*A. squamosa* × *A. cherimola*) and custard apple (*A. reticulata*, p. 21).

Cherimoyas are a good source of carbohydrate, fiber, iron, and niacin. As with other *Annona* species, the seeds, which contain several different alkaloids, are poisonous and must be removed before the fruit is mixed in a blender.



Annona glabra L.

POND APPLE, ALLIGATOR APPLE

Annonaceae (Custard apple family)



Description. The pond apple is a small deciduous tree, often with a thick base, 4–10 m (13–33 ft) tall. Alternate, leathery leaves elliptic to oblong, 12–26 cm (5–10 in) long, glossy with pointed tip. Solitary, hermaphroditic flowers cream-white with 3 fleshy, triangular outer petals. Smooth fruits globose, heart-shaped or oval, yellowish-green to yellow when ripe. Soft, sweet pulp orange-yellow, aromatic, with numerous winged, brown seeds.

Origin and Distribution. Native to tropical America from southern Florida to Argentina and Peru. Also grows naturally in West Africa. Occurs often in swamps or along rivers and lakes. Usually rare outside its natural habitat, but can be invasive where escaped from cultivation.

The tree is not grown in plantations, since the fruits are of inferior quality compared with closely related species of the same family. The pond apple is sometimes used as rootstock for other *Annona* species. The tree requires a humid tropical climate and can withstand prolonged flooding and waterlogged soils.

Food uses. The pulp, with a fruity, agreeable taste reminiscent of banana and overripe pineapple, is sometimes eaten fresh. Fully ripe pond apples are used to make jams, jellies, and fruit wine.

Comments. The pond apple is undoubtedly a minor member of the *Annona* genus, which contains important fruit tree species like the cherimoya (*A. cherimola*) and the sour sop (*A. muricata*, p. 19). The tree is an important food source for many bird and mammal species. The common name *alligator apple* reflects the fact that alligators in the Everglades swamps of southern Florida sometimes eat the ripe fruits that fall in the water.



Annona montana Macfad.

MOUNTAIN SOURSOP

Annonaceae (Custard apple family)



Description. Mountain soursop is a medium-sized tree with spreading branches, 8–12 m (26–39 ft) tall. Alternate, aromatic, oblong to elliptic leaves. Blades very glossy, dark green, 8–18 cm (3–7 in) long. Flowers yellowish with 3 fleshy, triangular outer petals and 3 inner petals. Fruits nearly spherical, 12–16 cm (5–6 in) in diameter with yellowish-green skin with short spines and white to lemon-colored soft flesh containing several inedible seeds. Depending on variety, the taste of the flesh ranges from very sweet to subacid and even bitter.

Origin and Distribution. Native to tropical America. The tree grows under tropical and subtropical conditions, tolerating a wide range of soil types and withstanding even light frosts.

Food uses. The lemon-colored flesh of superior varieties is eaten fresh or made into milk shakes or fruit juices. Pieces of the flesh can be added to fruit salads or used as a garnish for desserts.

Comments. The mountain soursop is much less appreciated than its close relative, the soursop (*A. muricata*). The fairly cold-hardy tree is sometimes used as rootstock to graft other *Annona* species. Another minor member of the Annonaceae is *A. glabra*, the alligator apple (p. 17), native to tropical America and West Africa and producing oval to heart-shaped fruits with a yellow skin. The pulp is sometimes made into jelly or wine.



Annona muricata L.

SOURSOP

Annonaceae (Custard apple family)



Soursop is a giant fruit, sometimes the size of a football.

Description. Soursop is a small evergreen tree 8–12 m (26–39 ft) tall. Alternate, leathery, shiny elliptic leaves, 6–12 cm (2.4–5 in) long. Yellowish-green flowers with 6 fleshy petals of which the outer 3 are fleshy and produced solitarily or in small clusters on branches and trunk. Aggregate fruits are ovoid or of irregular shape, dark green and covered in numerous soft spines. Fruits can grow to 20–40 cm (8–16 in) in length and weigh up to 4 kg (8.8 lbs) or more. Pulp creamy white, soft, juicy, fibrous with a pleasant sweet flavor. Fruits contain numerous black, shiny, very hard seeds. When fully ripe, the fruit changes color from dark green to light yellowish-green.

Origin and Distribution. The soursop is probably native to tropical regions of Central America, the Antilles, and northern South America. It is widely cultivated in Africa and tropical Asia and has become naturalized in many regions. The tree prefers a humid tropical climate and is usually grown in tropical lowlands. It can withstand short dry seasons.

Food uses. The soft, juicy pulp has a delicious, highly aromatic flavor reminiscent of pineapple mixed with banana. After the poisonous seeds are removed, the pulp is blended with water or milk to make delicious fruit drinks and milk shakes. The fruit is also used to flavor ice cream, sorbets, and yogurts. In Mexico, the chilled pulp is served as a dessert; in the Philippines, the unripe fruit is eaten as a vegetable.

Comments. The fruit is rich in carbohydrates and a good source of vitamins B1, B2, and C. Leaves, bark, and seeds have played an important role in indigenous medicine. The toxic seeds were used to kill external parasites like fleas and lice. A leaf decoction was used to lower fever, treat sores and wounds, and prevent insomnia.

The genus consists of approximately 110 species, of which several, including cherimoya (*A. cherimola*, p. 16) and custard apple (*A. reticulata*, p. 21), are grown for their edible fruits.



Annona purpurea Moc. & Sessé ex Dunal

SONCOYA

Annonaceae (Custard apple family)



The fruit is covered with hooked spines.

Description. Soncoya is a medium-sized deciduous tree, 7–12 m (23–39 ft) tall. Alternate leaves elliptic to oblong, 18–30 cm (7–12 in) long, with pointed apex. Blades brown, pubescent on both sides. Solitary flowers with 3 thick brown petals, yellowish-purple on the inside, and 3 thin, creamy-white inner petals. The fragrant flowers are pollinated by insects, especially beetles. Fruits round, 12–20 cm (5–8 in) in diameter with a thick stalk and surface covered with hooked spines. Soft orange pulp aromatic and sweet but somewhat fibrous. Taste reminiscent of mango.

Origin and Distribution. Native from southern Mexico and Central America to northern South America. Very rarely cultivated outside its natural range. It is almost exclusively grown as a dooryard tree. The soncoya requires a tropical climate with or without a dry season and constant warm temperatures.

Food uses. The pulp of ripe fruits is eaten out of hand or used to make fruit drinks with water or milk.

Comments. The soncoya is of minor horticultural interest compared with the more well-known members of this genus, including the soursop

(*A. muricata*, p. 19) and the cherimoya (*A. cherimola*, p. 16). Different parts of the plant have been used in traditional Mesoamerican medicine. The bark of the tree is said to be effective against dysentery and the fruit juice was used to alleviate fever as well as cold and flu symptoms.



Alternate leaves are elliptic to oblong, with a pointed apex.



Annona reticulata L.

CUSTARD APPLE

Annonaceae (Custard apple family)

The pulp of custard apple is sweet and aromatic.



Description. Custard apple is a small deciduous tree, 4–10 m (13–33 ft) tall, with an open crown and spreading branches. Alternate leaves oblong, 10–20 cm (4–8 in) long by 2–7 cm (0.8–2.8 in) wide, pointed at the apex. Fragrant flowers with 3 yellowish-green and cream-colored petals are borne in small, drooping clusters of 3 or 4. Compound fruits heart-shaped or of irregular shape, 8–18 cm (3–7 in) in diameter, with yellow-brown or reddish skin when ripe, with varying degree of reticulation. Pulp soft, cream-colored, sweet and aromatic, with numerous black, glossy seeds. The sweetness and aroma of the fruit depend on the variety and the individual.

Origin and Distribution. Probably native to the Caribbean and Central America, where it grows in tropical lowlands and mountains up to 1,000 m (3,300 ft). The plant spread in pre-Columbian times throughout tropical America and has become naturalized in many regions. The tree is fairly common in southern Africa and tropical Asia. The custard apple requires a tropical climate and more humid conditions than the closely related sugar apple (*A. squamosa*, p. 22).

Food uses. The fruit is less valued than other members of its genus, especially the sugar apple, the

cherimoya (*A. cherimola*, p. 16), and the soursop (*A. muricata*, p. 19). Custard apples are usually eaten fresh, or the pulp is scooped out and made into milk shakes, ice cream, or sauces for cakes. The flesh is served with cream and sugar and eaten as dessert.

Comments. The tree is sometimes used as rootstock for other *Annona* species. As with those other *Annona* species, the crushed seeds were commonly used as an insecticide to kill lice. Several parts of the plant play an important role in traditional medicine. Leaf extracts are used to treat skin infections, and leaf infusions are reputed to have a calming effect on humans.



Annona squamosa L.

SUGAR APPLE

Annonaceae (Custard apple family)



Description. Sugar apple is a small deciduous tree with an open crown and irregular branching, 3–8 m (10–26 ft) tall. Alternate leaves oblong, 6–16 cm (2.4–6.3 in) long by 3–5 cm (1.2–2 in) wide. Fragrant flowers are produced singly or in small clusters at tips of branches. Flowers 2–4 cm (0.8–1.6 in) long with fleshy, elongated, yellowish-green petals and a dark red base. Aggregate fruits gray-green, heart-shaped, 5–12 cm (2–5 in) in diameter with numerous round protuberances. Pulp yellowish-white, soft, in conical segments. The juicy, sweet, delicious-tasting flesh contains several to many hard black or brown seeds.

Origin and Distribution. Native to tropical America, though the exact origin is unknown. The sugar apple grows naturally in warm lowlands under dry or humid conditions. Seeds of the species were brought to India by Portuguese sailors before 1590. Today it is a popular fruit throughout tropical India. Spaniards brought the fruit tree to the Philippines, from where

it spread to the rest of tropical Asia and northern Australia. The sugar apple is cultivated in small-scale plantations or as a dooryard tree in most tropical and some subtropical countries.

Food uses. The pulp is eaten fresh. In parts of Asia, the strained pulp is used to flavor ice cream or to prepare milk shakes. It is important to remove the seeds before putting the pulp in an electric blender, since the crushed seeds are toxic. The pulp is processed industrially for the manufacture of desserts and ice creams.

Comments. The seeds of the sugar apple are toxic to humans when crushed and ingested. They were used by indigenous people as an insecticide to kill lice and other insects. A decoction of the leaves is used in traditional medicine of tropical America as a tonic, digestive aid, and febrifuge. This species is geographically the most widely grown *Annona* species.



Antidesma bunius (L.) Spreng.

BIGNAY

Phyllanthaceae (Leafflower family)



Description. Bignay is an evergreen tree growing 3–30 m (10–100 ft) tall with a dense crown. Alternate, oblong leaves 10–25 cm (4–10 in) long by 5–8 cm (2–3 in) wide, with glossy dark green, leathery blades. Reddish male and female flowers emit a strong smell and grow on separate trees. Male flowers are borne in terminal or axillary spikes and female flowers in terminal racemes up to 25 cm (10 in) long. Round fruits measuring 6–10 mm (0.24–0.4 in) in diameter grow in long pendent clusters. Fruits ripen unevenly, so showy clusters with white, pale green, yellow, red, and almost black fruits are produced. Each fruit contains a single seed embedded in a juicy, subacid, translucent, colorless pulp that has a tart and fairly sweet flavor when fully ripe.

Origin and Distribution. Native from India to Southeast Asia and northern Australia. It is planted mainly as a dooryard tree in its area of natural distribution. Grows in tropical and subtropical climates.

Food uses. Fruits are eaten fresh but more often made into jams and jellies. Bignay is squeezed to make juice, fermented to make wine, and distilled to make brandy. In Indonesia, the ripe fruits are cooked in the preparation of fish dishes and to make a sauce for seafood. Young leaves are stewed or eaten raw with rice as a green vegetable in several parts of Southeast Asia.

Comments. Two closely related species are the Herbert River cherry (*A. dallachyanum*) from northern Australia, with dark red fruits, and the black currant tree (*A. ghaesembilla*), from Cambodia and Vietnam, which grows as a shrubby tree and produces similar dark red or dark purple fruits.

Recent studies have shown that bignay fruits are high in flavonoids and phenolic acids, making the fruit potentially important as a natural antioxidant.



Arachis hypogaea L.

PEANUT

Fabaceae (Bean family)

Description. The peanut is an annual herbaceous plant growing 30–60 cm (12–24 in) tall. Opposite, compound leaves with 2 pairs of obtuse to broad elliptic leaflets, 2–7 cm (0.8–2.8 in) long. Flowers pealike with yellow petals and red venation. After pollination, the flower stalk elongates, bends down, and buries the developing fruit several centimeters into the soil. Seedpods with rough, light brown shells irregularly shaped, normally 3–6 cm (1.2–2.4 in) long, containing 1–4 seeds, each covered in a reddish-brown seed skin.

Origin and Distribution. Native to Bolivia and probably also indigenous to southern Peru and Paraguay. The domesticated peanut is unknown as a species in the wild. Possible progenitors are *A. ipaensis* and *A. duranensis*. Excavations of burial sites on the Andean slopes of northern Peru have produced the oldest archaeological evidence of peanuts, dating back 7,600 years. The peanut was commonly depicted on textiles and ceramics by many South American pre-Columbian civilizations, including the Moche, Inca, and others.

Food uses. Peanuts are enjoyed raw or roasted with salt, often mixed with other nuts and seeds. They are



The highly nutritious peanut was often used as survival food by Arctic expeditions.

made into or used as an ingredient in a vast variety of products, including candy, granola bars, cookies, and peanut butter. In Peru, peanuts are ground and made into a delicious, thick sauce with chilies, vegetables, and spices, served with rice and chicken (*ají de gallina*) or other meats and seafood. Peanut oil, which is rich in monounsaturated fat, is used as cooking oil. The highly nutritious seeds were often used as survival food by Arctic expeditions. In West Africa, ground peanuts are used in meat stews and soups.

Comments. Peanuts are a very good source of fat and protein, containing 38–47% oil, 24–35% protein, vitamins B and E, niacin, and folate as well as a high content of minerals like potassium, manganese, and phosphorus.

The largest exporters of peanuts are the United States, Argentina, and Brazil. China and India are the largest producers of peanuts, but the harvest is largely consumed in domestic markets.



Artocarpus altilis (Parkinson) Fosberg

BREADFRUIT

Moraceae (Mulberry family)

Description. Breadfruit is an evergreen tree, 20–30 m (66–100 ft) tall. Large, deeply lobed, alternate leaves ovate, 30–80 cm (12–31 in) long by 20–50 cm (8–20 in) wide, with a glossy, dark green surface and yellowish veins. Flowers monoecious; male spikes to 25 cm (10 in) long, female flowers in clusters with up to 2,000 single flowers. Fruits round, 20–30 cm (8–12 in) in diameter, with a warty light green surface and a cream-colored, starchy flesh. The pulp of the ripe fruit turns soft and yellowish in color. All parts of the plant contain white, sticky latex.

Origin and Distribution. The breadfruit is probably native to New Guinea and the Malay Archipelago. From there it spread with the colonization of the South Pacific islands by indigenous tribes. Today the tree is grown as a fruit or shade tree in many tropical countries having a warm, humid climate.

The breadfruit came to fame because of its role in the mutiny on the HMS *Bounty* in 1789. Under the command of Captain William Bligh, this ship was to sail with 1,000 potted breadfruit saplings from Tahiti to Jamaica, where the fruits were intended to feed the growing slave population. Within a month of the voyage, the crew rebelled because of a lack of fresh drinking water, and they expelled Captain Bligh and his supporters from the ship. Bligh survived the mutiny. In 1791, in a second attempt he successfully managed to transport breadfruit saplings to Jamaica. The slaves rejected the breadfruit, though, preferring plantains as food instead.

Food uses. Unripe, firm breadfruits taste similar to potatoes and can be used as such. They are commonly prepared as a cooked vegetable in numerous dishes and form an essential part of Asian curries. Fruits are also roasted, baked, stuffed, or mashed. Ripe, sweet-tasting breadfruits are used in desserts. In Hawaii, breadfruit *poi* is prepared by mashing breadfruit and baking it in an underground oven. Fresh fruit is cut in slices and dried in the sun to preserve it. A common way of preserving ripe breadfruits is to bury them in the ground, where they ferment. The product



In Hawaii, breadfruit poi is prepared by mashing breadfruit and baking it in an underground oven.

is a sour-tasting, soft, cheeselike paste, sometimes mixed with coconut milk and then cooked in banana leaves. In many African countries, baked breadfruit slices are served with salt and pepper as a side dish with everyday meals.

Comments. The usually seedless breadfruit and seeded breadnut (p. 26) are sometimes treated as two varieties of *A. altilis*. In this book they are treated as different species, with the seeded variety *A. camansi* and the seedless *A. altilis*, according to a recent publication by the Breadfruit Institute at the National Tropical Botanical Garden at Kauai, Hawaii. Breadfruits contain up to 25% carbohydrates and 70% water.



Artocarpus camansi Blanco

BREADNUT

Moraceae (Mulberry family)



Description. Breadnut is an evergreen tree, 10–20 m (33–66 ft) tall, with an open branching structure. All parts of the tree contain milky sap. Very large leaves up to 60 cm (24 in) long, leathery, glossy dark green, deeply lobed. Separate male and female flowers are produced on the same tree. Greenish female flowers on short, fleshy spikes develop into a large, syncarpous fruit. The flowers do not fuse as they do in breadfruit (*A. altilis*, p. 25). Fruits are green, spherical, 7–15 cm (2.8–6 in) in diameter, and covered in numerous short spines. Pulp cream-colored, firm when unripe, turning soft with ripeness, with 20–60 light brown seeds similar to chestnuts.

Origin and Distribution. The tree is probably indigenous to Papua New Guinea, Indonesia, and the Philippines. The breadnut was supposedly brought to the American continent around 1770 by French sailors, who took breadnut seeds from the Philippines to the French West Indies. Today the breadnut is grown throughout the tropics together with the closely related breadfruit. The breadnut, grown for its

edible fruits and seeds and as a shade tree, requires a humid, tropical climate.

Food uses. Immature fruits are thinly sliced, boiled in saltwater, and eaten in curries, soups, and stews in a manner similar to breadfruit. Normally, though, breadnuts are grown not for their starchy pulp but for their edible seeds. The seeds, similar in taste and appearance to chestnuts (*Castanea sativa*), are boiled, steamed, or roasted and consumed as salted snacks commonly sold by street vendors. In West Africa, the boiled seeds are sometimes mashed and served as a side dish. The seeds provide an edible oil and can be processed into a nut paste and canned in brine.

Comments. The breadnut is thought to be the wild ancestor of the breadfruit, to which it is very closely related and sometimes considered conspecific. The nutritious seeds, which contain 13–19% protein and are high in potassium and phosphorus, are relatively low in fat compared with other nuts like almonds and macadamia nuts.