***Annona muricata* L. =** *Soursop = Sauersack*

Guanabana, Corosol, Griarola

Guanábana

Guanábana (*Annona muricata*)

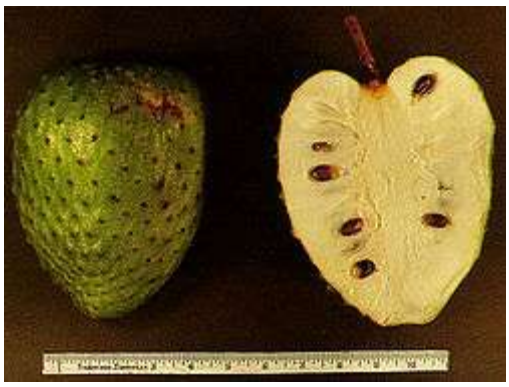
Systematik

Klasse:	Einfurchenpollen-Zweikeimblättrige (Magnoliopsida)
Unterklasse:	Magnolienähnliche (Magnoliidae)
Ordnung:	Magnolienartige (Magnoliales)
Familie:	Annonengewächse (Annonaceae)
Gattung:	*Annona*
Art:	Guanábana

Wissenschaftlicher Name

Annona muricata

Linnaeus



Frucht aufgeschnitten

Zweig, Blätter, Blüte und Frucht

Guanábana – auch *Guyabano* oder *Corossol* genannt – ist eine Baumart, aus der Familie der Annonengewächse (Annonaceae). Im Deutschen wird sie auch **Stachelannone** oder **Sauersack** genannt.

Inhaltsverzeichnis

[Verbergen]

Merkmale [Bearbeiten]

Der Baum ist immergrün und hat eine nur wenig verzweigte Krone. Er wird unter normalen Bedingungen 8–12 Meter hoch. Die Blätter ähneln Lorbeerblättern und sitzen wechselständig an den Zweigen. Die Blüten bestehen aus drei Kelch- und Kronblättern, sind länglich und von grüngelber Farbe. Sie verströmen einen aasartigen Geruch und locken damit Fliegen zur Bestäubung an. Die Frucht des Guanábana ist eigentlich eine große Beere. Sie wird bis zu 40 Zentimeter lang und bis zu 4 Kilogramm schwer. In dem weichen, weißen Fruchtfleisch sitzen große, schwarze (giftige) Samen. Die Fruchthülle ist mit weichen Stacheln besetzt, welche die Überreste des weiblichen Geschlechtsapparates bilden. Die Stacheln haben damit keine Schutzfunktion gegenüber Fraßfeinden.

Verbreitung [Bearbeiten]

Die Stachelannone kommt ursprünglich aus Südamerika und der Karibik. Sie wächst in Tieflandwäldern mit semiariden Klima. Vom Menschen wurde sie als Obstbaum in alle tropischen Regionen eingeführt, andere Arten der Annone gelangten auch zum Anbau nach Israel und Spanien.

Nutzen [Bearbeiten]

Das saftige gelblichweiße Fruchtfleisch schmeckt charakteristisch sauer. Für den Export hat diese Exotenfrucht deshalb kaum Bedeutung erlangt, zumal ihr Fruchtkörper im reifen Zustand sehr druckempfindlich ist und sich daher nur schwerlich transportieren lässt.

Annona muricata lässt sich sehr gut industriell verarbeiten: Das Fruchtfleisch wird ausgeschabt und durch Sieben von den schwarzen Samen getrennt. Der Schalenanteil (und damit der Abfall) ist gering, während die saftige Beschaffenheit eine hohe Ausbeute an Saft oder Püree ermöglicht, ihr Ausnutzungsgrad ist damit recht hoch. Die so gewonnenen Auszüge des Sauersacks werden regional unterschiedlich genutzt:

- In den südamerikanischen Ländern wird der Sauersack gerne ausgepresst und als vielseitiger, sehr fruchtiger Grundstoff für Erfrischungsgetränke, Eiscreme oder Marmelade benutzt.

- In Indonesien kocht man das Püree des Sauersacks mit Zucker zu einer Art Pudding („dodol sirsak“) oder macht daraus Süßigkeiten.
- Auf den Philippinen verzehrt man die unreifen Früchte gerne als Gemüse; sie schmecken dann ähnlich wie gerösteter Mais.
- Auf vielen karibischen Inseln (Curacao, St. Thomas, Bardos, Kuba) verzichtet man auf die Früchte und verwendet stattdessen die fermentierten Blätter zur Zubereitung eines Tees, der geschmacklich zwischen Kaffee und Schwarztee zu liegen scheint.

Die kleine Schwester der Stachelannone, die Cherimoya, wird als heißer Insidertipp in Delikatessgeschäften gehandelt: „Die Cherimoya gilt als die beste Tropenfrucht überhaupt. Süß und sahnig, wie Erd- und Himbeere und Birne zugleich, mit einem Hauch von Zimt als Würze“ wird die Cherimoya als die Königin der Tropenfrüchte gepriesen.[1]

Kulturgeschichte [Bearbeiten]

Die harten, schwarzglänzenden Samen wurden schon in altperuanischen Hochkulturen bei Gräbern gefunden. Entweder hat man die Samen direkt – oder aber die Früchte den Verstorbenen beigelegt. Die – je nach Art variablen – Vorzüge der Annona-Arten haben dafür gesorgt, dass der Mensch Annona auch außerhalb seines Ursprungslandes kultiviert hat. Als die Frucht nach Spanien kam, nannte man sie dort *Guanabana*, in Frankreich *Corossol*. Der eigentliche Name stammt aber aus Haiti, wo man die Frucht als „Anon“ (Rahmapfel) bezeichnete. Linné latinisierte den Namen später zu „Annona“. Die korrekte Bezeichnung ist also Annona muricata Linné.[2]

Toxikologie [Bearbeiten]

Das in den Samen der Guanabana enthaltene Nervengift Annonacin scheint die Ursache für eine neurodegenerative Krankheit, die nur auf der karibischen Inselgruppe Guadeloupe vorkommt und vermutlich mit dem Verzehr von annonacinhaltigen Pflanzen zusammenhängt, zu sein. Es handelt sich dabei um eine so genannte Tauopathie, die mit einer pathologischen Anreicherung des Tau-Proteins im Gehirn verbunden ist. Die experimentellen Ergebnisse belegen erstmals, dass für diese Akkumulation tatsächlich das pflanzliche Nervengift Annonacin verantwortlich ist.[3]

Quellen [Bearbeiten]

1. ↑ In: GRÄFE, UNZER, Das große Buch der Exoten. S. 29
2. ↑ In: Samson: Tropical Fruits, S. 216.
3. ↑ Informationsdienst Wissenschaft: *Tauopathie durch pflanzliches Nervengift*, 4. Mai 2007

Literatur [Bearbeiten]

- Rolf Blancke: *Farbatlas Pflanzen der Karibik und Mittelamerikas*, 1999, Verlag Eugen Ulmer, ISBN 3-8001-3512-4

Weblinks [Bearbeiten]

Commons: Annona muricata – Album mit Bildern, Videos und Audiodateien

Von „http://de.wikipedia.org/wiki/Guanabana“

Kategorien: Annonengewächse | Obst | Baum

Soursop

From Wikipedia, the free encyclopedia

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For the herbaceous plant, see Oxalis pes-caprae.

Soursop

Soursop branch with flower and fruit

Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Magnoliids
Order:	Magnoliales
Family:	Annonaceae
Genus:	*Annona*
Species:	***A. muricata***

Binomial name
Annona muricata L.[1]

The **soursop** (Spanish **guanábana**, Portuguese **graviola**, *Annona muricata*; syn. *A. sericea* Dunal in Correia, M. P., (1984), *A. macrocarpa* Wercklé, *A. bonplandiana* H.B. & K., *A. cearensis* Barb.Rodr., *A. coriacea*, *Guanabanus muricatus* (L.) M.Gómez in Rain-tree) is a broadleaf flowering evergreen tree native to Mexico, Central America, the Caribbean and northern South America. Soursop is also native to Sub-Saharan Africa countries that lie within the tropics. Today, it is also grown in some areas of Southeast Asia. It is in the same genus as the chirimoya and the same family as the pawpaw. In most Spanish speaking countries it is commonly known as Guanábana. In the Philippines, it is known as *guyabano*.

The soursop is adapted to areas of high humidity and relatively warm winters, temperatures below 5 °C/41 °F will cause damage to leaves and small branches, and temperatures below 3 °C/37.4 °F can be fatal.

Its flavor is described as a combination of strawberry and pineapple with sour citrus flavor notes contrasting with an underlying creamy flavor reminiscent of coconut or banana.

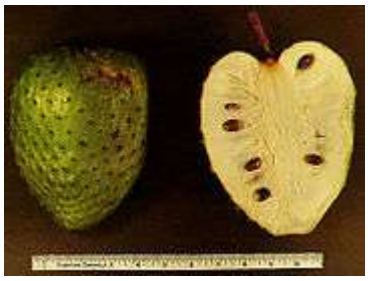
Contents

[hide]

[edit] Cultivation and uses

The plant is grown as a commercial crop for its 20-30 cm /7.87-11.8 inch long prickly green fruit, which can have a mass of up to 2.5 kg/5.5 lbs.

Away from its native area, there is some limited production as far north as southern Florida within USDA Zone 10; however these are mostly garden plantings for local consumption. It is also grown in parts of southeastern Asia. The soursop will reportedly fruit as a container specimen, even in temperate climates if protected from cool temperatures.



Soursop fruit whole and sliced

The flesh of the fruit consists of an edible white pulp and a core of indigestible black seeds. The species is the only member of the genus *Annona* that is suitable for processing and preservation. The sweet pulp is used to make juice as well as candies, sorbets, and ice cream flavorings.

In Mexico it is a common fruit often used for dessert as the only ingredient, or as an agua fresca beverage. Ice cream and fruit bars made of soursop are also very popular. The seeds are normally left in the preparation, and removed while consuming.

In Indonesia, *dodol sirsak*, a sweetmeat, is made by boiling soursop pulp in water and adding sugar until the mixture hardens. Soursop is also common ingredient for making fresh fruit juices that are sold at most of street food vendors. In Vietnam, this fruit is called *mãng cầu Xiêm* in the South, or *quả Na* in the North and is used to make juice, or eaten as is. In Cambodia, this fruit is called "Tearb Barung" literally meant "Western Custard-apple fruit." In Malaysia it is known in Malay as 'Durian Belanda' and in East Malaysia specifically the Dusun race in Sabah it is locally known as 'lampun'. Popularly it is eaten raw when it ripens. Usually the fruits are taken from the tree when they mature and left to ripen in a dark corner whereby it will be eaten when it is fully ripe i.e. it is soft when you press the fruit. It has a white flower with a very pleasing scent especially in the morning.

Soursop fruit on tree

Nutritionally, the fruit is high in carbohydrates, particularly fructose. The fruit also contains significant amounts of vitamin C, vitamin B1, and vitamin B2. The fruit, seeds, and leaves have a number of herbal medicinal uses among indigenous peoples of regions where the plant is common.

In the Caribbean it is believed that laying the leaves of the soursop on a bed below a sleeping person with a fever will break the fever by the next morning. Also, boiling the leaves and drinking may help induce sleep.[2]

The tea, fruit, and juice are used medicinally to treat illness ranging from stomach ailments to worms.

[edit] Health risks

Research carried out in the Caribbean has suggested a connection between consumption of soursop and atypical forms of Parkinson's disease due to the very high concentration of annonacin.[3][4][5][6]

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1. ^ "Annona muricata information from NPGS/GRIN". www.ars-grin.gov. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?3492. Retrieved 2008-03-03.
2. ^ "Tropical Plant Database:GRAVIOLA (Annona muricata)". Raintree Nutrition. http://www.rain-tree.com/graviola.htm. Retrieved 2006-12-13.
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4. ^ Champy, Pierre; et al. (2005-08-02). "Quantification of acetogenins in Annona muricata linked to atypical parkinsonism in guadeloupe". *Movement Disorders* **20** (12): 1629–1633. doi:10.1002/mds.20632.
5. ^ Lannuzel A, Höglinger GU, Champy P, Michel PP, Hirsch EC, Ruberg M. (2006). "Is atypical parkinsonism in the Caribbean caused by the consumption of Annonacae?". *J Neural Transm Suppl.* **70** (70): 153–7. doi:10.1007/978-3-211-45295-0_24. PMID 17017523.
6. ^ Caparros-Lefebvre D, Elbaz A. (1999-07-24). *Possible relation of atypical parkinsonism in the French West Indies with consumption of tropical plants: a case-control study*. **354**. pp. 281–6. PMID 10440304.

[edit] See also

Wikimedia Commons has media related to: ***Annona muricata***

- Cherimoya
- Custard-apple
- Sugar-apple

[edit] External links

- **(Portuguese)** Correia, M. P., (1984) *Dicionário das plantas úteis do Brasil*
- Description of soursop from *Fruits of Warm Climates* (1987, ISBN 0-9610184-1-0)
- Sorting Annona names
- Soursop / Guyabano Fruit Nutrition
- Rain-tree: *Annona muricata*
- Soursop List of Chemicals (Dr. Duke's)

Annona

Stachelannone (*Annona muricata*)

Systematik

Abteilung:	Bedecktsamer (Magnoliophyta)
Klasse:	Einfurchenpollen-Zweikeimblättrige (Magnoliopsida)

Unterklasse:	Magnolienähnliche (Magnoliidae)
Ordnung:	Magnolienartige (Magnoliales)
Familie:	Annonengewächse (Annonaceae)
Gattung:	*Annona*

Wissenschaftlicher Name

Annona

L.

Atemoya, eine Kreuzung von Cherimoya und Zimtapfel

Annona ist eine Gattung der Annonengewächse (Annonaceae). Zu ihr gehören etwa 110 Arten immergrüner Bäume der Tropen und Subtropen. Einige dieser Arten sind kommerziell bedeutsam, wie etwa die Cherimoya, die Stachelannone oder der Zimtapfel.

Die Bäume tragen breite, längliche, stark geäderte Blätter und Blüten mit einem intensiven, fruchtreichem Geruch. Die Früchte haben eine feste Haut, die bei einigen Arten mit weichen Stacheln versehen ist. Zu den wichtigsten Arten dieser Gattung zählen:

- Cherimoya (*Annona cherimola*)
- Ilama (*Annona diversifolia*)

- Stachelannone (*Annona muricata*)
- Netzannone (*Annona reticulata*)
- Zimtapfel (*Annona squamosa*)
- *Annona senegalensis*

Inhaltsverzeichnis

[Verbergen]

Verwendung [Bearbeiten]

Die Früchte werden roh gegessen oder zu Getränken und Speiseeis verarbeitet. Die Kerne der Annonafrucht werden in Sri Lanka von Kindern zu einem Spiel in der Art des Englisch Fußball verwendet.

Aus allen Teilen der Pflanze können Acetogenine isoliert werden. Diese Stoffklasse zeichnet sich durch ihre insektizide und anti-tumorale Wirkung aus. Die Blätter von *A. senegalensis* werden in Westafrika zur Linderung von Insektenstichen verwendet.

Toxikologie [Bearbeiten]

Das in Guanabana enthaltene Nervengift Annonacin scheint die Ursache für eine neurodegenerative Krankheit zu sein, die nur auf der karibischen Inselgruppe Guadeloupe vorkommt und vermutlich mit dem Verzehr von annonacinhaltigen Pflanzen zusammenhängt. Es handelt sich dabei um eine so genannte Tauopathie, die mit einer pathologischen Anreicherung des Tau-Proteins im Gehirn verbunden ist. Experimentelle Ergebnisse belegen erstmals, dass für diese Akkumulation tatsächlich das pflanzliche Nervengift Annonacin verantwortlich ist.[1][2]

Quellen [Bearbeiten]

1. ↑ P. Champy et al.: *Annonacin, a lipophilic inhibitor of mitochondrial complex I, induces nigral and striatal neurodegeneration in rats: possible relevance for atypical parkinsonism in Guadeloupe*, J Neurochem. 2004 Jan;88(1):63–69, PMID 14675150
2. ↑ Myriam Escobar Khondiker (2007): *Annonacin, a Natural Complex I Inhibitor of the Mitochondrial Respiratory Chain, causes Tau Pathology in Cultured Neurons*

Weblinks [Bearbeiten]

Commons: Annona – Sammlung von Bildern, Videos und Audiodateien

- Annonaceae – Custard Apple Family

Kategorien: Annonengewächse | Annonaceae

Annona

From Wikipedia, the free encyclopedia
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Annona

Pond-apple (*Annona glabra*)

Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Magnoliids
Order:	Magnoliales
Family:	Annonaceae
Genus:	***Annona*** L.[1]

Species

Some 100-150, see text.

Synonyms

Guanabanus Mill.
Raimondia Saff.
Rollinia A. St.-Hil.
Rolliniopsis Saff.[2]

Annona squamosa flower & leaves in Hyderabad, India.

Annona squamosa fruit in Hyderabad, India.

For other meanings, see Annona (disambiguation).

Annona is the second largest genus, after *Guatteria*, in the plant family Annonaceae[3], containing approximately 110 species of mostly Neotropical and Afrotropical trees and shrubs.[4] The name derives from the Taíno *annon*[4]. Paleoethnobotanical studies have dated *Annona* exploitation and cultivation in the Yautepec River region of Mexico to approximately 1000 BC.[5]

Currently, seven *Annona* species and one hybrid are grown for domestic or commercial use mostly for the edible and nutritious fruits.[6] Many of the species are used in traditional medicines for the treatment of a variety of diseases. Several annonacaeous species have been found to contain acetogenins, a class of natural compounds with a wide variety of biological activities.[7][8]

Contents

[hide]

[edit] Description

Taprooted evergreen or semi-deciduous tropical trees or shrubs.[4]

Trunks

> Thin bark that has broad and shallow depression or fissures which join together and are scaly. Slender, stiff, cylindrical and tapering shoots with raised pores and naked buds.[4]

Leaves

> Leaf blades can be leathery or thin and rather soft or pliable, bald or hairy.[4]

Flowers

> The flowering stalks rise from an axil, or occasionally from axillary buds on main stem or older stems, or as solitary flowers or small bundle of flowers. Usually three or four deciduous sepals that are smaller than the outer petals that do not overlap while in bud. Six to eight fleshy petals in two whorls—the petals of the outer whorl are larger and do not overlap; inner petals are ascending, distinctively smaller and nectar glands are darker pigmented. Numerous stamens that are ball, club-shaped, or curved and hooded or pointed beyond anther sac. Numerous pistils, attached directly to the base, partially united to various degrees with distinct stigmas. One or two ovules per pistil; style and stigma club-shaped or narrowly conic.[4]

Fruits

> One fleshy, ovate to spherical fruit per flower. Each fruit consisting of many individual small fruits or syncarps; one syncarp and seed per pistil. Seeds beanlike with tough coats.[4]

Pollination

> Dynastid scarab beetles appears basic within the genus *Annona*. Those species of Annona which are more morphologically derived, as well as all *Rollinia* spp. possess reduced floral chambers and attract small beetles like Nitidulidae or Staphylinidae.[9]

[edit] Images

Atemoya (a hybrid of *A. cherimola* and *A. squamosa*)

Cherimoya plantation

Brazilian guanábana

Sugar apples

Inside Custard Apple from Benin

Inside Custard Apple from Benin

Outside Custard Apple from Benin

[edit] Selected species

The following is a list of some of the more important species. Many of them have significant agricultural, medicinal, pharmaceutical, and other uses. Synonyms appear in the sub-list.[10]

- *Annona amambayensis*
- *Annona ambotay*
- *Annona asplundiana*
- *Annona atabapensis*
- *Annona ×atemoya* (Atemoya)
- *Annona bullata*
- *Annona cacans*
- *Annona calophylla*
- *Annona campestris*
- *Annona cherimola* (Cherimoya)
  - *Annona pubescens*
  - *Annona tripetala*
- *Annona conica*
- *Annona coriacea*
- *Annona cornifolia*
- *Annona crassiflora* (Marolo)
- *Annona cristalensis*
- *Annona crotonifolia*
- *Annona deceptrix*
- *Annona deminuta*
- *Annona dioica*
- *Annona diversifolia* (Ilama)
- *Annona dolichophylla*
- *Annona echinata*
- *Annona ecuadorensis*
- *Annona ekmanii*
- *Annona excellens*
- *Annona glabra* (Pond-apple, Alligator-apple, Monkey-apple)
  - *Annona palustris*
- *Annona glaucophylla*
- *Annona haematantha*
- *Annona hayesii*
- *Annona hypoglauca*
- *Annona hystricoides*
- *Annona jahnii*
- *Annona jamaicensis*
- *Annona longiflora*
- *Annona lutescens*
- *Annona macrocalyx*
- *Annona malmeana*
- *Annona manabiensis*
- *Annona microcarpa*
- *Annona montana* Macfad. (Mountain Soursop)
  - *Annona marcgravii* Mart.
- *Annona muricata* (Soursop, Guanábana)
  - *Annona macrocarpa* auct.
- *Annona nutans*
- *Annona oligocarpa*
- *Annona paludosa*
- *Annona paraguayensis*
- *Annona phaeoclados*
- *Annona praetermissa*
- *Annona purpurea* (Sonconya)
- *Annona pygmaea*
- *Annona reticulata* (Custard-apple, Bullock's-heart, Corazón)
- *Annona salzmannii*
- *Annona scleroderma* (Poshe-te, Cawesh)
- *Annona senegalensis* (African Custard-Apple)
  - *Annona chrysophylla*
- *Annona sericea*
- *Annona spinescens*
- *Annona spraguei*
- *Annona squamosa*

- *Annona dolabripetala*
- *Annona monticola*
- (Sugar-apple, Sweetsop, Anón)
- *Annona testudinea*
- *Annona trunciflora*

[edit] Insects and diseases

Annona are generally disease free. They are susceptible to some fungus and wilt. Ants are a problem since they promote mealy bugs on the fruit.[11]

Insects

- *Braephratiloides cubense* (Annona seed borer)
- *Bepratelloides cubense* (Annona seed borer)[12][13]
- *Morganella longispina* (Plumose scale)
- *Philephedra* n.sp. (Philephedra scale)
- *Pseudococcus* sp. (Mealy bugs)
- *Xyleborus* sp. (Ambrosia beetles)[12]
- *Ammiscus polygrophoides*
- *Anastrepha atrox*
- *Anastrepha barandianae*
- *Anastrepha bistrigata*
- *Anastrepha chiclayae*
- *Anastrepha disticta*
- *Anastrepha extensa*
- *Anastrepha fraterculus*
- *Anastrepha oblicua*
- *Anastrepha serpentina*
- *Anastrepha striata*
- *Anastrepha suspensa*
- *Apate monachus*
- *Bactrocera* spp.
- *Bephrata maculicollis*
- *Brevipalpus* spp.
- *Ceratitis capitata*
- *Cerconota anonella*
- *Coccoidea* spp.
- *Emanadia flavipennis*
- *Gelwchiidae* spp.
- *Heliothrips haemorphoidalis*
- *Leosynodes elegantales*
- *Lyonetia* spp.
- *Oiketicus kirby*
- *Orthezia olivicola*
- *Phyllocnistis* spp.
- *Pinnaspis aspidistrae*
- *Pseudococcus citri*
- *Saissetia nigra*
- *Talponia* spp.
- *Tenuipalpidae*
- *Tetranynchus* spp.
- *Thrips*[14]

Fungi

- *Armillaria* (oak root fungus)
- *Ascochyta cherimolaer*
- *Botryodiplodia theobremae*
- *Cercospora annonaceae*
- *Cladosporium carpophilum*
- *Colletotrichium* spp.
- *Colletotrichium annonicola*
- *Colletotrichium gloeosporioides*
- *Corticium salmonicolor*
- *Fumagina* spp.
- *Fusarium solani*
- *Gloeosporium*
- *Glomerella cingulata*
- *Isariopsis anonarum*
- *Koleroga noxis*
- *Oidium*
- *Phakopsora cherimolae*
- *Phomopsis* spp.
- *Phomopsis annonacearum*
- *Phyllosticta*
- *Phythium* spp.
- *Phytophtora palmivora*
- *Phytophtora parasitica*
- *Rhizopus nigricans*
- *Rhizopus stolonifer*
- *Rhizoctonia spp.*
- *Rhizoctonia solani*
- *Salssetia oleare*
- *Sclerotium rolfsii*
- *Uredo cherimola*

- *Monilia*
- *Nectria episphaeria*
- *Verticillium (wilt)*
- *Zignoella annonicola*[11][14]

Nematodes

- *Cephalobidae* spp.
- *Dorylaimidae* spp.
- *Gracilacus* spp.
- *Helicotylenchus* spp.
- *Hemicycliophora* spp.
- *Hoplolaimidae* spp.
- *Meloidogyne incognita* spp.
- *Pratylenchus* spp.
- *Paratylenchus micoletzky. Rhabditis* spp.
- *Tylenchorhynchus* spp.
- *Xiphinema americanum* [14]

Algae

- *Cephaleuros virescens*
- *Cephalosporium* spp.
- *Paecilomyces* spp.[14]

Diseases

- *Diplodia natalensis* (Dry fruit rot)
- Fruit rot[12]

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1. ^ Natural Resources Conservation Service (NRCS). "PLANTS Profile, *Annona* L.". *The PLANTS Database*. United States Department of Agriculture. http://plants.usda.gov/java/profile?symbol=ANNON. Retrieved 2008-04-16.
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[edit] External links

- Media related to Annona at Wikimedia Commons
- Information related to ***Annona*** from Wikispecies.
- Type Collections of Neotropical Annonaceae - *Annona* — has pictures and details on these and other *Annona* species

Categories: Annona | Fruit | Annonaceae genera

Soursop

Annona muricata

- Description
- Origin and Distribution

Of the 60 or more species of the genus *Annona*, family Annonaceae, the soursop, *A. muricata* L., is the most tropical, the largest-fruited, and the only one lending itself well to preserving and processing.

It is generally known in most Spanish-speaking countries as *guanabana*; in E1 Salvador, as *guanaba*; in Guatemala, as *huanaba*; in Mexico, often as *zopote de viejas*, or *cabeza de negro*; in Venezuela, as *catoche* or *catuche*; in Argentina, as *anona de puntitas* or *anona de broquel*; in Bolivia, *sinini*; in Brazil, *araticum do grande, graviola*, or *jaca do Para*; in the Netherlands Antilles, *sorsaka* or *zunrzak*, the latter name also used in Surinam andJava; in French-speaking areas of the West Indies, West Africa, and Southeast Asia, especially North Vietnam, it is known as *corossol*, *grand corossol, corossol epineux*, or *cachiman epineux*. In Malaya it may be called *durian belanda*, *durian maki*; or *seri kaya belanda*; in Thailand, *thu-rian-khack*.

In 1951, Prof. Clery Salazar, who was encouraging the development of soursop products at the College of Agriculture at Mayaguez, Puerto Rico, told me that they would like to adopt an English name more appealing than the word "soursop", and not as likely as *guanabana* to be mispronounced. To date, no altematives have been chosen.

Description

Plate 10: SOURSOP, *Annona muricata*

Fig. 20: Exceptionally large and well-formed soursops (*Annona muricata*) in a Saigon market, 1968.

The soursop tree is low-branching and bushy but slender because of its upturned limbs, and reaches a height of 25 or 30 ft (7.5-9 m). Young branchlets are rusty-hairy. The malodorous leaves, normally evergreen, are alternate, smooth, glossy, dark green on the upper surface, lighter beneath; oblong, elliptic or narrowobovate, pointed at both ends, 2 1/2 to 8 in (6.25-20 cm) long and 1 to 2 1/2 in (2.5-6.25 cm) wide. The flowers, which are borne singly, may emerge anywhere on the trunk, branches or twigs. They are short stalked, 1 1/2 to 2 in (4 5 cm) long, plump, and triangular-conical, the 3 fleshy, slightly spreading, outer petals yellow-green, the 3 close-set inner petals pale-yellow.

The fruit is more or less oval or heart-shaped, some times irregular, lopsided or curved, due to improper carper development or insect injury. The size ranges from 4 to 12 in (10-30 cm) long and up to 6 in (15 cm) in width, and the weight may be up to 10 or 15 lbs (4.5-6.8 kg). The fruit is compound and covered with a reticulated, leathery-appearing but tender, inedible, bitter skin from which protrude few or many stubby, or more elongated and curved, soft, pliable "spines". The tips break off easily when the fruit is fully ripe. The skin is dark-green in the immature fruit, becoming slightly yellowish-green before the mature fruit is soft to the touch. Its inner surface is cream-colored and granular and separates easily from the mass of snow-white, fibrous, juicy segments—much like flakes of raw fish—surrounding the central, soft-pithy core. In aroma, the pulp is somewhat pineapple-like, but its musky, subacid to acid flavor is unique. Most of the closely-packed segments are seedless. In each fertile segment there is a single oval, smooth, hard, black seed, l/2 to 3/4 in (1.25-2 cm) long; and a large fruit may contain from a few dozen to 200 or more seeds.

Origin and Distribution

Oviedo, in 1526, described the soursop as abundant in the West Indies and in northern South America. It is today found in Bermuda and the Bahamas, and both wild and cultivated, from

sea-level to an altitude of 3,500 ft (1,150 m) throughout the West Indies and from southern Mexico to Peru and Argentina. It was one of the first fruit trees carried from America to the Old World Tropics where it has become widely distributed from southeastern China to Australia and the warm lowlands of eastern and western Africa. It is common in the markets of Malaya and southeast Asia. Very large, symmetrical fruits have been seen on sale in South Vietnam. It became well established at an early date in the Pacific Islands. The tree has been raised successfully but has never fruited in Israel.

In Florida, the soursop has been grown to a limited extent for possibly 110 years. Sturtevant noted that it was not included by Atwood among Florida fruits in 1867 but was listed by the American Pomological Society in 1879. A tree fruited at the home of John Fogarty of Manatee before the freeze of 1886. In the southeastern part of the state and especially on the Florida Keys, it is often planted in home gardens.

In regions where sweet fruits are preferred, as in South India and Guam, the soursop has not enjoyed great popularity. It is grown only to a limited extent in Madras. However, in the East Indies it has been acclaimed one of the best local fruits. In Honolulu, the fruit is occasionally sold but the demand exceeds the supply. The soursop is one of the most abundant fruits in the Dominican Republic and one of the most popular in Cuba, Puerto Rico, the Bahamas, Colombia and northeastern Brazil.

In 1887, Cuban soursops were selling in Key West, Florida, at 10 to 50 cents apiece. In 1920, Wilson Popenoe wrote that: "In the large cities of tropical America, there is a good demand for the fruits at all times of the year, a demand which is not adequately met at present." The island of Grenada produces particularly large and perfect soursops and regularly delivers them by boat to the market of Port-of Spain because of the shortage in Trinidad. In Colombia, where the soursop is generally large, well-formed and of high quality, this is one of the 14 tropical fruits recommended by the Instituto Latinoamericano de Mercadeo Agricola for large-scale planting and marketing. Soursops produced in small plots, none over 5 acres (2.27 ha), throughout Venezuela supply the processing plants where the frozen concentrate is packed in 6 oz (170 g) cans. In 1968, 2,266 tons (936 MT) of juice were processed in Venezuela. The strained pulp is also preserved commercially in Costa Rica. There are a few commercial soursop plantations near the south coast of Puerto Rico and several processing factories. In 1977, the Puerto Rican crop totaled 219,538 lbs (99,790 kg).

At the First International Congress of Agricultural and Food Industries of the Tropical and Subtropical Zones, held in 1964, scientists from the Research Laboratories of Nestle Products in Vevey, Switzerland, presented an evaluation of lesser-known tropical fruits and cited the soursop, the guava and passionfruit as the 3 most promising for the European market, because of their distinctive aromatic qualities and their suitability for processing in the form of preserved pulp, nectar and jelly.

Varieties

In Puerto Rico, the wide range of forms and types of seedling soursops are roughly divided into 3 general classifications: sweet, subacid, and acid; then subdivided as round, heart-shaped, oblong or angular; and finally classed according to flesh consistency which varies from soft and juicy to firm and comparatively dry. The University of Puerto Rico's Agricultural Experiment Station at one time cataloged 14 different types of soursops in an area between Aibonito and Coamo. In El Salvador, 2 types of soursops are distinguished: *guanaba azucaron* (sweet) eaten raw and used for drinks; and *guanaba acida* (very sour), used only for drinks. In the Dominican Republic, the *guanabana dulce* (sweet soursop) is most sought after. The term "sweet" is used in a relative sense to indicate low acidity. A medium-sized, yellow-green soursop called *guanabana sin fibre* (fiberless) has been vegetatively propagated at the Agricultural Experiment Station at Santiago de las Vegas, Cuba. The foliage of this superior clone is distinctly bluish-green. In 1920, Dr. Wilson Popenoe sent to the United States Department of Agriculture, from Costa Rica, budwood of a soursop he named 'Bennett' in honor of G.S. Bennett, Agricultural Superintendent of the Costa Rican Division of the United Fruit Company. He described the fruit as large and handsome (as shown in the photograph accompanying the introduction record No. 51050) and he declared the tree to be the most productive he had seen.

Fig. 21: The soursop tree may bear fruits anywhere on its trunk or branches. Multiple-stems of this tree are the result of its having been frozen to the ground more than once.

Climate

The soursop is truly tropical. Young trees in exposed places in southem Florida are killed by only a few degrees of frost. The trees that survive to fruiting age on the mainland are in protected situations, close to the south side of a house and sometimes near a source of heat. Even so, there will be temporary defoliation and interruption of fruiting when the temperature drops to near freezing. In Key West, where the tropical breadfruit thrives, the soursop is perfectly at home. In Puerto Rico, the tree is said to prefer an altitude between 800 and 1,000 ft (244300 m), with moderate humidity, plenty of sun and shelter from strong winds.

Soil

Best growth is achieved in deep, rich, well-drained, semi-drysoil, but the soursop tree can be and is commonly grown in acid and sandy soil, and in the porous, oolitic limestone of South Florida and the Bahama Islands.

Propagation

The soursop is usually grown from seeds. They should be sown in flats or containers and kept moist and shaded. Germination takes from 15 to 30 days. Selected types can be reproduced by cuttings or by shield-budding. Soursop seedlings are generally the best stock for propagation, though grafting onto custard apple (*Annona reticulata*), the mountain soursop (*A. montana*), or pond apple (*A. glabra*), is usually successful. The pond apple has a dwarfing effect. Grafts on sugar apple (*A. squamosa*) and cherimoya (*A. cherimola*) do not live for long, despite the fact that the soursop is a satisfactory rootstock for sugar apple in Ceylon and India.

Culture

In ordinary practice, seedlings, when 1 ft (30 cm) or more in height are set out in the field at the beginning of the rainy season and spaced 12 to 15 ft (3.65-4.5 m) apart, though 25 ft (7.5 m) each way has been suggested. A spacing of 20 x 25 ft (6x7.5 m) allows 87 trees per acre (215/ha). Close-spacing, 8 x 8 ft (2.4x2.4 m) is thought aufficient for small gardens in Puerto Rico. The tree grows rapidly and begins to bear in 3 to 5 years. In Queensland, well-watered trees have attained 15 to 18 ft (4.5-5.5 m) in 6 to 7 years. Mulching is recommended to avoid dehydration of the shallow, fibrous root system during dry, hot weather. If in too dry a situation, the tree will cast off all of its old leaves before new ones appear. A fertilizer mixture containing 10% phosphoric acid, 10% potash and 3% nitrogen has been advocated in Cuba and Queensland. But excellent results have been obtained in Hawaii with quarterly applications of 10-10-10 N P K—1\2 lb (.225 kg) per tree the first year, 1 lb (.45 kg)/tree the 2nd year, 3 lbs (1.36 kg)/tree the 3rd year and thereafter.

Season

The soursop tends to flower and fruit more or less continuously, but in every growing area there is a principal season of ripening. In Puerto Rico, this is from March to June or September; in Queensland, it begins in April; in southern India, Mexico and Florida, it extends from June to September; in the Bahamas, it continues through October. In Hawaii, the early crop occurs from January to April; midseason crop, June to August, with peak in July; and there is a late crop in October or November.

Harvesting

The fruit is picked when full grown and still firm but slightly yellow-green. If allowed to soften on the tree, it will fall and crush. It is easily bruised and punctured and must be handled with care. Firm fruits are held a few days at room temperature. When eating ripe, they are soft enough to yield to the slight pressure of one's thumb. Having reached this stage, the fruit can be held 2 or 3 days longer in a refrigerator. The skin will blacken and become unsightly while the flesh is still unspoiled and usable. Studies of the ripening process in Hawaii have determined that the optimum stage for eating is 5 to 6 days after harvest, at the peak of ethylene production. Thereafter, the flavor is less pronounced and a faint offodor develops. In Venezuela, the chief handicap in commercial processing is that the fruits stored on racks in a

cool shed must be gone over every day to select those that are ripe and ready for juice extraction.

Yield

The soursop, unfortunately, is a shy-bearer, the usual crop being 12 to 20 or 24 fruits per tree. In Puerto Rico, production of 5,000 to 8,000 lbs per acre (roughly equal kg/ha), is considered a good yield from well-cared-for trees. A study of the first crop of 35 5 year-old trees in Hawaii showed an average of 93.6 lbs (42.5 kg) of fruits per tree. Yield was slightly lower the 2nd year. The 3rd year, the average yield was 172 lbs (78 kg) per tree. At this rate, the annual crop would be 16,000 lbs per acre (roughly equal kg/ha).

Pests & Diseases

Queensland's principal soursop pest is the mealybug which may occur in masses on the fruits. The mealybug is a common pest also in Florida, where the tree is often infessed with scale insects. Sometimes it may be infected by a lace-wing bug.

The fruit is subject to attack by fruit flies—*Anastrepha suspensa, A. striata* and *Ceratitis capitata*. Red spiders are a problem in dry climates.

Dominguez Gil (1978 and 1983), presents an extensive list of pests of the soursop in the State of Zulia, Venezuela. The 5 most damaging are: 1) the wasp, *Bephratelloides* (*Bephrata*) *maculicollis*, the larvae of which live in the seeds and emerge from the fully-grown ripe fruit, leaving it perforated and highly perishable; 2) the moth, *Cerconota* (*Stenoma*) *anonella*, which lays its eggs in the very young fruit causing stunting and malformation; 3) *Corythucha gossipii*; which attacks the leaves; 4) *Cratosomus inaequalis*, which bores into the fruit, branches and trunk; 5) *Laspeyresia* sp., which perforates the flowers. The first 3 are among the 7 major pests of the soursop in Colombia, the other 4 being: *Toxoptera aurantii*; which affects shoots, young leaves, flowers and fruits; present but not important in Venezuela; *Aphis spiraecola*; *Empoasca* sp., attacking the leaves; and *Aconophora concolor*, damaging the flowers and fruits. Important beneficial agents preying on aphids are *A phidius testataceipes, Chrysopa* sp., and *Curinus* sp. Lesser enemies of the soursop in South America include: *Talponia backeri* and *T. batesi* which damage flowers and fruits; *Horiola picta* and *H. lineolata*, feeding on flowers and young branches; *Membracis foliata*, attacking young branches, flower stalks and fruits; *Saissetia nigra*; *Escama ovalada*, on branches, flowers and fruits; *Cratosomus bombina*, a fruit borer; and *Cyclocephala signata*, affecting the flowers.

In Trinidad, the damage done to soursop flowers by *Thecla ortygnus* seriously limits the cultivation of this fruit. The sphinx caterpillar, *Cocytius antueus antueus* may be found feeding on soursop leaves in Puerto Rico. Bagging of soursops is necessary to protect them from *Cerconota anonella*. However, one grower in the Magdalena Valley of Colombia claims that bagged fruits are more acid than others and the flowers have to be handpollinated.

It has been observed in Venezuela and El Salvador that soursop trees in very humid areas often grow well but bear only a few fruits, usually of poor quality, which are apt to rot at the tip. Most of their flowers and young fruits fall because of anthracnose caused by *Collectotrichum gloeosporioides*. It has been said that soursop trees for cultivation near San Juan, Puerto Rico, should be seedlings of trees from similarly humid areas which have greater resistance to anthracnose than seedlings from dry zones. The same fungus causes damping-off of seedlings and die-back of twigs and branches. Occasionally the fungus, *Scolecotrichum* sp. ruins the leaves in Venezuela. In the East Indies, soursop trees are sometimes subject to the root-fungi, *Fomes lamaoensis* and *Diplodia* sp. and by pink disease due to *Corticum salmonicolor*.

Food Uses

Soursops of least acid flavor and least fibrous consistency are cut in sections and the flesh eaten with a spoon. The seeded pulp may be torn or cut into bits and added to fruit cups or salads, or chilled and served as dessert with sugar and a little milk or cream. For years, seeded soursop has been canned in Mexico and served in Mexican restaurants in New York and other northern cities.

Fig. 22: Canned soursop concentrate is produced in Venezuela. On the branch at the right is a soursop flower.

Most widespread throughout the tropics is the making of refreshing soursop drinks (called *champola* in Brazil; *carato* in Puerto Rico). For this purpose, the seeded pulp may be pressed in a colander or sieve or squeezed in cheesecloth to extract the rich, creamy juice, which is then beaten with milk or water and sweetened. Or the seeded pulp may be blended with an equal amount of boiling water and then strained and sweetened. If an electric blender is to be used, one must first be careful to remove all the seeds, since they are somewhat toxic and none should be accidentally ground up in the juice.

In Puerto Rican processing factories, the hand-peeled and cored fruits are passed through a mechanical pulper having nylon brushes that press the pulp through a screen, separating it from the seeds and fiber. A soursop soft drink, containing 12 to 15% pulp, is canned in Puerto Rico and keeps well for a year or more. The juice is prepared as a carbonated bottled beverage in Guatemala, and a fermented, cider-like drink is sometimes made in the West Indies. The vacuum-concentrated juice is canned commercially in the Philippines. There soursop drinks are popular but the normal "milk" color is not. The people usually add pink or green food coloring to make the drinks more attractive. The strained pulp is said to be a delicacy mixed

with wine or brandy and seasoned with nutmeg. Soursop juice, thickened with a little gelatin, makes an agreeable dessert.

In the Dominican Republic, a soursop custard is enjoyed and a confection is made by cooking soursop pulp in sugar sirup with cinnamon and lemon peel. Soursop ice cream is commonly frozen in refrigerator ice-cube trays in warm countries.

In the Bahamas, it is simply made by mashing the pulp in water, letting it stand, then straining to remove fibrous material and seeds. The liquid is then blended with sweetened condensed milk, poured into the trays and stirred several times while freezing. A richer product is made by the usual method of preparing an ice cream mix and adding strained soursop pulp just before freezing. Some Key West restaurants have always served soursop ice cream and now the influx of residents from the Caribbean and Latin American countries has created a strong demand for it. The canned pulp is imported from Central America and Puerto Rico and used in making ice cream and sherbet commercially. The pulp is used, too, for making tarts and jelly, sirup and nectar. The sirup has been bottled in Puerto Rico for local use and export. The nectar is canned in Colombia and frozen in Puerto Rico and is prepared fresh and sold in paper cartons in the Netherlands Antilles. The strained, frozen pulp is sold in plastic bags in Philippine supermarkets.

Immature soursops are cooked as vegetables or used in soup in Indonesia. They are roasted or fried in northeastern Brazil. I have boiled the half-grown fruit whole, without peeling. In an hour, the fruit is tender, its flesh off-white and mealy, with the aroma and flavor of roasted ears of green corn (maize).

Food Value Per 100 g of Edible Portion*

Calories	61.3-53.1
Moisture	82.8g
Protein	1.00g
Fat	0.97g
Carbohydrates	14.63g
Fiber	0.79g
Ash	60g
Calcium	10.3 mg
Phosphorus	27.7 mg

Iron	0.64 mg
Vitamin A (B-carotene)	0
Thiamine	0.11 mg
Riboflavin	0.05 mg
Niacin	1.28mg
Ascorbic Acid	29.6 mg
Amino Acids:	
Tryptophan	11 mg
Methionine	7 mg
Lysine	60mg

*Analyses made at the Laboratorio FIM de Nutricion, Havana, Cuba.

Toxicity

The presence of the alkaloids anonaine and anoniine has been reported in this species. The alkaloids muricine, $C_{19}H_{21}O_4N$ (possibly des-N-methylisocorydine or des-N methylcorydine) and muricinine, $C_{18}H_{19}O_4$ (possibly des-N-methylcorytuberine), are found in the bark. Muricinine is believed to be identical to reticuline. An unnamed alkaloid occurs in the leaves and seeds. The bark is high in hydrocyanic acid. Only small amounts are found in the leaves and roots and a trace in the fruit. The seeds contain 45% of a yellow non-drying oil which is an irritant poison, causing severe eye inflarnmation.

Other Uses

Fruit: In the Virgin Islands, the fruit is placed as a bait in fish traps.

Seeds: When pulverized, the seeds are effective pesticides against head lice, southern army worms and pea aphids and petroleum ether and chloroform extracts are toxic to black carpet beetle larvae. The seed oil kills head lice.

Leaves: The leaf decoction is lethal to head lice and bedbugs.

Bark: The bark of the tree has been used in tanning. The bark fiber is strong but, since fruiting trees are not expendable, is resorted to only in necessity. Bark, as well as seeds and roots, has been used as fish poison.

Wood: The wood is pale, aromatic, soft, light in weight and not durable. It has been used for ox yokes because it does not cause hair loss on the neck.

In Colombia, it is deemed to be suitable for pipestems and barrelstaves. Analyses in Brazil show cellulose content of 65 to 76%, high enough to be a potential source of paper pulp.

Medicinal Uses: The juice of the ripe fruit is said to be diuretic and a remedy for haematuria and urethritis. Taken when fasting, it is believed to relieve liver ailments and leprosy. Pulverized immature fruits, which are very astringent, are decocted as a dysentery remedy. To draw out chiggers and speed healing, the flesh of an acid soursop is applied as a poultice unchanged for 3 days.

In *Materia Medica* of British Guiana, we are told to break soursop leaves in water, "squeeze a couple of limes therein, get a drunken man and rub his head well with the leaves and water and give him a little of the water to drink and he gets as sober as a judge in no time." This sobering or tranquilizing formula may not have been widely tested, but soursop leaves are regarded throughout the West Indies as having sedative or soporific properties. In the Netherlands Antilles, the leaves are put into one's pillowslip or strewn on the bed to promote a good night's sleep. An infusion of the leaves is commonly taken internally for the same purpose. It is taken as an analgesic and antispasmodic in Esmeraldas Province, Ecuador. In Africa, it is given to children with fever and they are also bathed lightly with it. A decoction of the young shoots or leaves is regarded in the West Indies as a remedy for gall bladder trouble, as well as coughs, catarrh, diarrhea, dysentery and indigestion; is said to "cool the blood," and to be able to stop vomiting and aid delivery in childbirth. The decoction is also employed in wet compresses on inflammations and swollen feet. The chewed leaves, mixed with saliva, are applied to incisions after surgery, causing proudflesh to disappear without leaving a scar. Mashed leaves are used as a poultice to alleviate eczema and other skin afflictions and rheumatism, and the sap of young leaves is put on skin eruptions.

The roots of the tree are employed as a vermifuge and the root bark as an antidote for poisoning. A tincture of the powdered seeds and bay rum is a strong emetic. Soursop flowers are believed to alleviate catarrh.

http://www.hort.purdue.edu/newcrop/morton/soursop.html

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New Crops from Brazil

David Arkcoll

INTRODUCTION

Brazil and especially the unexplored regions of the Amazon, are extremely rich sources of plant germplasm with potential as new crops. Establishing the correct selection criteria is important to evaluate the true potential of the many promising species by calling attention to their assets and to the missing information and problems facing each species. This must be accomplished efficiently to justify the considerable investment in relevant research needed to develop the most promising plants into commercially viable crops.

Much of the current interest in new crops arises from the over production of traditional cereals and soybeans by major producer and exporting countries. This has led to the expensive practice of paying farmers to leave land idle in the USA, clearly an undesirable situation. Furthermore, traditional markets like Europe and the developing world are increasing their own production to relieve their shortages and reduce their imports. In some cases, these countries are even compelling in export markets with their surpluses. Examples are the explosion of rape seed in Europe and the large amount of soybeans now being produced by Brazil and Argentina. The tendency is to replace imports, hence the interest in the USA in finding alternatives to rubber (e.g. guayule), lauric oils (e.g. *Cuphea*) and cellulose (e.g. kenaf). This in turn will force traditional producers of these products to search for alternative crops as well.

There are many other good reasons for looking to new crops. These include the need to diversify from vulnerable dependence on the few major grain crops, the increasing interest in novelty foods, the industrial requirement for new compounds (e.g. new colorants, polyvinyl

plastics), and new nutritional recommendations (e.g. gamma linolenic acid and new low calorie sweeteners). There is also a need for new crops to expand agriculture into marginal lands, especially in the tropics where few viable alternatives are found. New systems like agroforestry and biomass production also may require new crops.

SELECTING NEW CROPS

Ideally, having decided on a precise need, one would then look for a plant that has the desired characteristics. In practice what has tended to happen is that a botanist studies an interesting species and then tries to find a market for it. However, there are a series of characteristics that a wild plant must have if it is to ever make the large jump from botanical curiosity into viable crop. These include agricultural industrial and marketing characteristics (Arkcoll and Clement 1989). It should be easy to propagate, precocious, rustic, productive, be easy to harvest, and fit into current farm practice. The product must be easy to transport, store, and process. It should also be able to enter an established market at a competitive price or should be so attractive that a new market can be easily created.

We have been evaluating some of the most interesting species in this light in an effort to reduce the number to a few with the greatest potential. These and other species being developed in Brazil, are examined below to draw attention to the current stage of development, the missing data and the major problems that each one faces.

Bactris gasipaes (Peach palm, Pejebaye)

The Peach palm has attracted much attention in the last decade because of the texture and composition of the fruit mesocarp which is usually similar to that of a starchy cereal or root crop. It is consequently an important backyard tree in much of tropical Latin America and is used as a dietary staple by some Amerindian tribes (FAO 1986, Clement and Arkcoll 1989). The small crown and very high yield of some trees have suggested that it could be a useful plantation crop capable of producing large amounts of basic food in the wet tropics. We have been studying this potential as an important part of attempts to create ecologically attractive "food forests" to produce food from a permanent perennial system (Arkcoll 1978, 1979, 1984). Some introductions are very rich in oil (62% of mesocarp dry matter) suggesting that selecting for this character would be an interesting alternative because of the local and world markets for oil and protein rich meals (Arkcoll and Aguiar 1984). Most fruit have a bland taste that is not exotic enough to export, however some with a sweetish flavor may have more potential as a table fruit and at least expand local markets. The crop has only been grown on a large commercial scale for palmhearts in Costa Rica where over 2000 ha have been planted. The viability of this venture has been dependent on Government subsidy as it is difficult for plantations to compete with raw material coming from wild *Euterpe edulis* in Brazil. It is especially interesting as a source of palmhearts because it tillers and grows extremely fast (Gomes and Arkcoll 1987). Unfortunately, this vegetative vigor is proving to be a problem in fruit production as the fruit are produced too high above the ground to harvest after a few years. Precocity has been observed and there are signs of different growth rates suggesting that researchers might locate dwarf phenotypes. Managing tillers as in banana plantations, is also being considered. While individual stem yields of over 80 kg/yr. have been recorded, plantation yields have been frustrated by uneven bearing and tremendous fruit drop caused by poor pollination, drought, nutrient deficiencies, and principally pests and diseases. It is hoped that these problems can be controlled the crop is better understood. The successful selection and combination of desired characteristics could make this crop as important as the coconut in the wet tropics.

Astrocaryum aculeatum (Tucuma)

Tucuma, a heavily spined palm, is of interest because of the oily mesocarp and large kernel. A very brief examination of a few dozen introductions from the Manaus market, identified one with over 30% oil in the fresh fruit (Arkcoll et al. 1986, Arkcoll 1988). However, the species is only used locally for the direct consumption of the very thin pulp. This is bitter, nutty, and oily and rarely appreciated by the newcomer. However, it is so appreciated by locals that it costs as much as a dollar a dozen. Despite the premium price, tucuma is not grown commercially because there are enough native trees to satisfy demand. The species often becomes dominant in secondary forests because of resistance to fire and perhaps this characteristic can be used to recover worn out and abandoned pasture (FAO 1986). Difficulty in breaking seed dormancy and slow initial growth, have dampened the enthusiasm of research workers, but the large variation found in *A. vulgare* (Lima et al. 1986), a similar species with several stems, suggests that both species deserve more attention.

Acrocomia aculeata (Macauba)

Macauba palm is somewhat similar to the last palm in that its fruit have a large amount of both pulp and kernel oil and together with several very similar species, is widespread throughout central and Latin America often on poor soils. Its apparent tolerance to drought, makes it an attractive species for producing oil in regions that are too dry for the African oil palm and coconuts. The very high yield predictions of 6 t/ha (Wandeck and Justo 1982) have not been confirmed yet because of difficulties in breaking dormancy and slow early growth. Rapid hydrolysis of the mesocarp oil and difficulty in separating oil from the moist, fibrous and mucilaginous pulp, are among the other problems that still have to be faced (FAO 1986, Arkcoll 1988).

Cuphea spp.

The several hundred widely spread species in this genus have been of interest for about a decade, because of the unique composition of their seed oils. This varies with species, with the most interesting having over 80% lauric acid (Graham et al. 1981, Graham and Kleiman 1985). As most species are small herbaceous plants and many are adapted to the colder regions of highland Mexico, it is hoped that a mechanized crop suitable for temperate climates might be developed and reduce the dependency of lauric oil importing countries on wildly fluctuating supplies from coconut producers. Satisfactory yields have not been achieved in the USA because of shattering (Hirsinger and Knowles 1984, Hirsinger 1985). Attention has been drawn to several other problems such as seed dormancy, slow growth and the variable chromosome numbers and fatty acid composition observed in different species (Arkcoll 1988). Many wild species have not yet been studied and an effort is being made to collect this germplasm in order to locate desirable characteristics. Research is also in progress to obtain indehiscence through mutations and also to splice the appropriate *Cuphea* genes into a conventional crop such as rape (Thompson 1984, Tokay 1985). Sudden success in either of these efforts could lead rapidly to the development of an important new crop to supply the enormous market for lauric oils. It would also help to expand markets for medium chain (mixtures of C8 and C10) triglycerides that have considerable commercial potential, especially as lubricants and nutritionally desirable and medically useful oils (Bach and Babayan 1982). There is considerable interest in the pharmacological properties of extracts from the whole plant of some species used as a cure-all in local folk medicine in Brazil. There is now scientific confirmation of several potentially useful separate effects including depression of the central nervous system and the ability to reduce blood pressure in experimental animals (Ericeira et al. 1984).

Annona muricata (Soursop)

The large fruit of the soursop is much appreciated in several Latin American countries mainly as a sweetened juice but also as an ice cream and yoghurt flavoring. Several small commercial plantations are now in operation with about 2000 ha planted in Brazil and more planned. Yields have been disappointingly low, rarely reaching 7 t/ha in plantations sown from seed. Yields from individual trees very significantly suggesting that considerable improvement could be achieved via clonal selection. Production problems include low fruit set due to poor pollination and adverse climatic conditions and the attack of several devastating pests and diseases (FAO 1986). The flavor is somewhat volatile so pasteurized products are less attractive than fresh ones, and the off white color can become an unpleasant grey unless oxidation is prevented. The premature sale of several poor bottled products is thought to have limited market penetration. Frozen and chilled products seem more successful elsewhere (Arkcoll 1987), especially in regions where the fresh fruit is well known and appreciated.

Eugenia stipitata (Araçá-boi)

Araçá-boi, a little known fruit from the Western Amazon is very attractive in appearance and has an exquisite fragrance. Although extremely sour to the taste, the sweetened juice has performed well in acceptance trials. In early performance trials two-year old bushes produced high yields (FAO 1986). The main production drawbacks are susceptibility to anthracnose, soft fruit texture and volatility of aroma. Consequently, resistance is being sought, firm fruit are harvested a little green with small loss in quality and the market will probably be restricted to fresh and frozen products. Studies on the aroma are planned as this may have a market in its own right.

Psidium angulatum (Araçá-Pera)

This is one of the most interesting of the many wild acidic guavas known collectively in Brazil as Araçá. Its sour juice is so concentrated that it must be diluted 10 times and well sweetened to produce a very acceptable drink. Once again, the delicate flavor is affected by heating so that fresh and frozen products are superior to pasteurized juices. The fruit comes from the eastern Amazon and there are only a few experimental plantations at the moment. Initial impressions are that the plant is rustic and productive although the yields are low compared to guavas. Interspecific breeding may be promising. The leathery skin should avoid damage during transport and together with the high acidity, give some resistance to insect attack. Fruit are quite variable and clonal selection is needed to obtain superior introductions (FAO 1986). Another wild acidic guava receiving attention *is Feijoa sellowiana* from the extreme south of the country (Mattos 1986).

Spondias lutea (Taperebá, Cajá)

Taperebá or Cajá is one of the most popular fruit in the North and Northeast of Brazil. The fruit itself is rarely eaten directly as the pulp is thin and usually quite sour, however it makes a superb sweetened juice and ice cream or ice lollipop of excellent flavor. The flavor is volatile and pasteurized products are not attractive. No plantations are known which is surprising as the demand is in excess of the current supply from the many large trees found scattered at low density over a wide area of forest. Trees grow fast from seed but take over 5 years to fruit. Like most *Spondias,* they can be propagated easily from large cuttings to fruit quickly and reduce the size of the trees. This is important as the very soft fruit are often bruised when harvested from the ground beneath large trees. Most fruit are small and have a large seed and thin layer of pulp so a search is on for fruit said to be as large as *S. dulcis*. The tree appears to be rather rustic and productive although no data on yields is available (FAO 1986).

Theobroma grandiflorum (Cupuassu)

A highly perfumed pulp surrounding the seeds of Cupuassu, a large relative of Cacao, is much appreciated in the Amazon region for making sweetened juice, ice cream or charlotte desserts. It fetches the highest price of all fruits in the local markets and there are now several hundred hectares planted to supply the Belem and Manaus markets. Newcomers often find the aroma a little overpowering at first, but soon acquire a liking for it. This volatile aroma could be extracted and might find a market in the flavor and perfume industry. Yields are low in the field (Calzavara 1987) and there is only about 40% pulp in most fruit. Seedless fruit are known with larger amounts of pulp. However, the seed can be made into a number of chocolate-like products and so could become a useful byproduct if large scale production becomes viable (Arkcoll and Clement 1988). Selection for higher yield and resistance to witches broom is needed (FAO 1986).

Couepia longipendula (Egg nut)

Apart from the major Brazilian nuts, (cashew and brazil) there are many other interesting examples. One of these is *Couepia longipendula* (egg nut) because of its excellent flavor. This large tree is common in the forest around Manaus but although widely eaten in the rural areas, it never reaches the local market so is little known. The shell is hard and thick requiring an ax to break it. Nuts with thinner shells are said to exist in the forest. Trees are rather slow growing so grafting onto the more vigorous rootstock of *C. subcordata* is being considered (FAO 1986). The kernels are rich in oil which appears to have some unusual polyunsaturated fatty acids.

Couma utilis (Sorva)

Over 5000 t of sorva latex are exported from this plant each year as a substitute for chicle gum. Much of it is obtained by destructive tapping of wild trees. Because these are being decimated quickly, *Achras sapota* trees are slow growing and increasingly rare and industrial substitutes are contaminated with heavy metals, there is considerable interest in establishing plantations of *C. utilis*. A few experimental trees have grown very fast on poor soil but tapping yields have not been obtained yet. The tree is also very decorative and the good flavored fruit are sold in local markets. The fruit might become a useful subproduct of latex plantations, however, they are too soft and not thought to be interesting enough to consider more seriously in their own right (FAO 1986).

Paullinia cupana (Guaraná)

Roasted seeds of this plant are ground up to make an interesting cola type drink called guaraná. Over 1000 t are now produced annually in Brazil on about 5000 ha of poor oxisols. Vegetative propagation of selected plants is starting to increase yields and the local market is now thought to be saturated. An export drive is now in progress and seems to be having some success, especially in Japan. The drink owes much of its popularity to the stimulation produced by its high caffeine content and the widely held belief in its rejuvenating and aphrodisiacal properties (Cavalcanti 1988). Well formulated products can be very good although several of the most popular brands contained very little or no real guarana until recent legislation, aimed at supporting growers, made the inclusion of a small amount compulsory.

Stevia rebaudiana (Stevia)

Dried leaves from this small shrub from the south of Brazil, have been used as a local sweetener and cure-all for generations. The main active ingredient, stevioside, is said to be up to 300 times as sweet as sucrose. Extraction processes have been developed in Japan and Brazil and over 100 t/year sold in a purified form until recently when doubt has been cast over its toxicity and the mutagenicity of the

metabolite, steviol (Pezzuto et al. 1985, S. Cascon pers. commun.). Studies are in progress to clarify this situation and some derivatives that are believed to be safe, have been synthesized and patented (Dubois et al. 1984). About a 100 ha are now planted annually in Brazil to satisfy the local demand, mainly by natural health shops for dried leaves. Yields of 2 to 3 t/ha of leaf with about 10% stevioside are obtained.

Bixa orellana (Annatto)

Restrictions on the use of many synthetic colorants and the relative instability of most other carotenoids, are leading to the increasing use of bixin, especially in the dairy industry. World production, estimated at about 3,000 t of annatto seed in 1983 (Anand 1983), is now thought to have risen rapidly to over 10,000 t, about half of which comes from Brazil. Until recently, annatto (or urucum as it is known in Brazil) was little more than a back garden crop. However, high prices and the good yields have resulted in a few farmers planting it on a larger scale. Yields, after 4 years, can pass 2 t/ha with 0.9 to 6.9% (average about 2.5%) bixin covering the seeds in a sticky resin (Nicholson 1964, I. Guimaraes pers. commun.). Yields from seedling trees are very variable as the crop is cross pollinated. Variation in the exact composition of the colorants in the final extracted products limits marketability. Vegetative propagation is easy and should make rapid advances possible especially if the crop is selected for a combination of yield and bixin content. The relatively small market for colorants could quickly become saturated so there is interest in the potential of this rustic perennial crop as an alternative grain for growing on exhausted tropical soils. The high yield potential despite any scientific attempts at improvement, makes it a very promising crop.

CONCLUSIONS

The above species have been identified by a series of multidisciplinary criteria as some of the best Brazilian options for development into new crops. They are found in various stages of development from early germplasm collection to small commercial plantations. Attention is drawn to some of the missing data and problems that they face if they are to overcome the risks of early commercial plantations and make the large jump from botanical curiosities to useful crops. Appropriate research is now underway to collect the missing data and to resolve the problems, however it is bedeviled by a lack of continuity. Germplasm maintenance and work with tree crops, especially breeding, are very long term projects that funding bodies have failed to face so much research has been wasted in the past (Arkcoll and Clement 1989). Thought is needed on how one forms and keeps a multidisciplinary team together over many years in countries with wildly fluctuating economies and poor working conditions.

It is also well known that few crops have been successfully exploited on a large scale near their center of diversity because of indigenous pests and diseases, so that local research will probably benefit other regions of the globe. Thus, improvements in the exchange of germplasm are important if many new crops are to be fully evaluated and developed.

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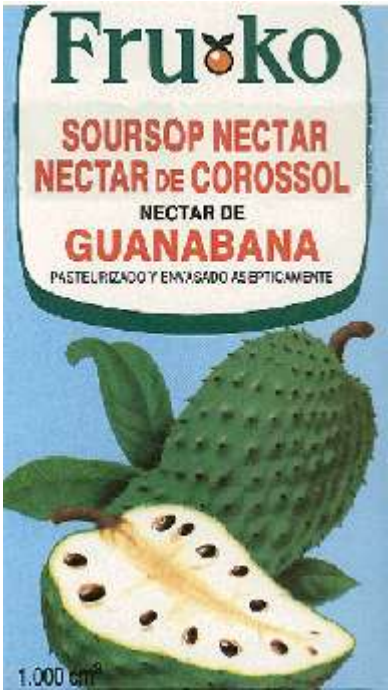
Soursop

Annona muricata L.

Guanabana, Corosol, Griarola

Annonaceae

Source: Magness et al. 1971



This tropical tree is a small evergreen, up to 15 to 20 feet, with leathery, obovate leaves, native to tropical America. Fruits are very large, up to 5 pounds, and heart shaped, dark green in color. The skin is glabrous, but bears numerous fleshy spines. The interior flesh is white, with soft, cottony strands that contain many seeds. Flesh is tart, desirable for ices and ade drinks. It is an important fruit in Puerto Rico and other tropical American areas. It is too tender for culture in continental U.S., except in the warmest parts of Florida.

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