BURSERACEAE

Canarium odontophyllum Miq. Dabai (Malay, Iban)

Canarium is a rather large genus of trees found in the Old World tropics with one species in the West Indies.



Seedling derived plants of *Canarium odontophyllum* fruit at about four years after planting

The *dabai* tree also known as Sibu olive is common in Sarawak except in swamps and coastal sands. It has been domesticated in Sarawak and cultivated extensively in the Sibu and Kapit Divisions. It is a tall medium-sized tree growing to about 20 m. The bark is grey-brown. Leaves with 3-8 pairs of leaflets. Leaflets oblong to lanceolate 9.5-28 x 4-11 cm. It is dioecious with male and female flowers borne on separate plants although some farmers claim that sexing of seedlings can be done based on the colour of the young shoots, this has not been statistically proven. Seedlings will flower at about four years after planting. The female flowers are carried on terminal infloresences. The immature fruits are white turning pink and powdery black colour on ripening. The fruits are oval to ellipsoid, 3-4 cm long and 1.5-2.0 cm in diameter. Before eating, fruits need to be soaked in lukewarm water for about 15 minutes to soften the mesocarp. Good quality fruits are plump, and possess a thick mesocarp that is soft, oily, deep yellow, smooth textured and rich flavoured. It can be eaten as a delicacy by itself or as a side dish with rice and other dishes in a meal. Salt or sugar and soya sauce are often added to enhance the taste of the fruit. It is often preserved in salt or soya sauce and eaten with porridge. The hard seed can be cracked to obtain the kernal which is eaten as a nut. It has an almond taste and flavour.



Immature fruits of *Canarium odontophyllum* are white turning pink and powdery black colour on ripening



Freshly harvested Canarium odontophyllum fruits



The hard seed of *Canarium odontophyllum* can be cracked to obtain the kernal with almond flavoured taste

In order to encourage cultivation of *dabai*, clonal selection, vegetative propagation or sexing of plants at the seedling stage must be done. Vegetative propagation will reduce the juvenile period, ensure an all female and productive stand and ensure quality and yield of the crop. Sexing of seedlings will ensure an all female and productive stand. This should be accompanied by post harvest studies, product development and market promotion for this speciality fruit. It is extremely nutritious being rich in energy, fat, protein, fibre and minerals phosphorus, potassium, calcium, magnesium and iron.

It is propagated from seeds but the Sarawak Department of Agriculture has successfully done vegetative propagation of this fruit tree although the success rate is low.

Nutrient composition of Canarium odontophyllum

		N	utrie	nt co	mposi	tion p	er 10(g ed	ible p	ortio	n-				
	Compo	sition							•	Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
339	41.3	3.8	2 6.2	22.1	4.3	2.3	65	810	200	106	13	8	7.0	4.7	Na**

*ppm

** not available

Dacryodes rostrata Bl. Kembayau (Malay, Iban)

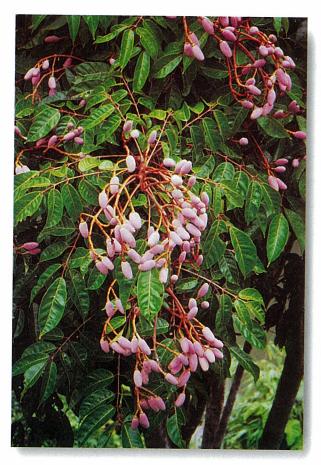
Kembayau is indigenous to Borneo growing in the mixed dipterocarp forests to 800 m. The tree has a columnar trunk growing to 40-45 m high. The bark is dark grey. Leaves with 2-8 pairs of leaflets which is ovate to oblong 8-30 x 3.5-11 cm. It takes 8 – 10 years to mature. The terminal inflorescences bear fruits which are white when immature turning to yellow, pink and bluish black on maturity. It looks similar to the *dabai* except that the seed is softer. It is prepared for eating by immersing in lukewarm water for about 15 minutes. After pouring away the water, a little salt is added to enhance the taste. The mesocarp is often preserved in salt and consumed with rice or porridge. Like *dabai* it is very nutritious with high values for energy, protein, and minerals. The cotyledons of the seed are also edible but are less tasty compared to *dabai* seed.



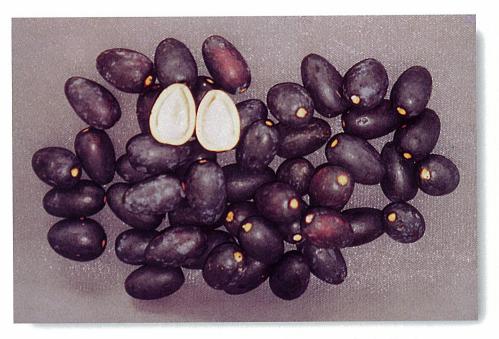
A mature Dacryodes rostrata tree with fruits



Terminal inflorescence of Dacryodes rostrata



Immature fruits of *Dacryodes rostrata* are white, yellow or pink in colour



The black mature fruits of *Dacryodes rostrata* is similar to *Canarium odontophyllum* in many ways

Nutrient composition of Dacryodes rostrata

Composition Minerals * * * * Vit Moisture Protein Fat CHO Fibre Ash P K Ca Mg Fe Mn Cu Zn C

Energy Moisture Protein Fat CHO (mg) (mg) (ug) (ug) (ug) (ug) (mg) (%)(mg) (mg) (Kcal) (g) (g) (g) (g) (g) 1.3 35 399 83 83 11 84 7.5 10.0 Na** 56.2 3.4 16.1 20.7 2.4 241

Nutrient composition per 100 g edible portion

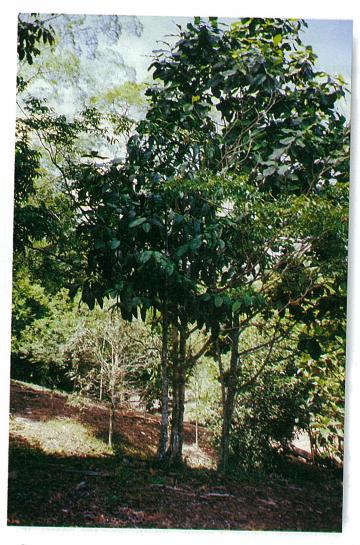
*ppm

** not available

CLUSIACEAE

Garcinia caudiculata Ridl. Bunau (Iban)

Garcinia is a rather large genus of trees and shrubs found in the tropics of the Old World. Garcinia caudiculata is a small tree with straight trunks carrying large dark green leaves. The young fruits are attractive bright purple in colour with a purple black knob-like stigma. The sepals persist as prominent green appendages held by the short peduncle. On ripening the fruits turn purplish green. The thick rind contains six seeds with thin white pulp. It has low potential for domestication and commercialization on account of the thin pulp.



Garcinia caudiculata is a small tree with large dark green leaves



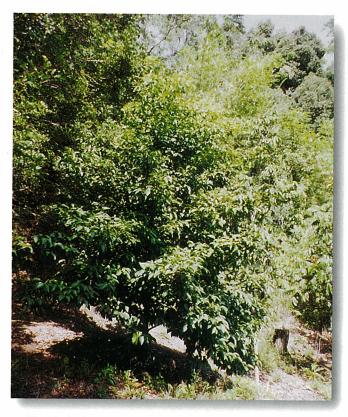
Immature fruits of Garcinia caudiculata are bright purple in colour



The thick rind of *Garcinia caudiculata* fruit contains six seeds with thin white pulp

Garcinia hombroniana Pierre Beruas (Malay)

A tree, closely resembling the mangosteen in appearance, found in the Nicobar Islands, the Malay Peninsula and Borneo, where it occurs chiefly near the coasts. It grows to a height of 10m. The flowers are small, pale green with large fleshy yellow calyx and epicalyx. The single fruit is green when young maturing to yellow and cherry red.



Garcinia hombroniana is a small handsome tree with dark shiny foliage

Between the red fruit-shell and the seeds is a sour edible pulp, with the flavour of peaches; this is eaten wherever the tree grows. It has low potential for development into a commercial fruit. A decoction of the root may be administered after childbirth as a preventive medicine. It and the leaves are prescribed for itch. *Beruas* gives timber for house-building and for making oars.



The single fruit of *Garcinia hombroniana* is green when young maturing to yellow and cherry red



Between the red fruit-shell and the seeds is a sour edible pulp

Garcinia mangostana L. Manggis (Malay), Sikup (Iban)

Mangosteen is grown in Malaysia, Burma, S. China and the Philippines. The mangosteen fruit may not be the most common indigenous fruit in Sarawak but it is the most well known worldwide. Known as the "Queen of Fruits" it should be further promoted to achieve its real commercial potential.



Garcinia mangostana is a slow growing pyramidal shaped evergreen tree

The mangosteen plant is a small, slow growing evergreen tree up to 10 m high with opposite unifoliate, thick leathery leaves. It is dioecious but female trees produce fruits with apomictic seeds when grown in isolation. Male trees are rare to non-existent. When damaged, all plant parts exude a yellow latex. Flowers are terminal. Petals yellow-buff flushed pink round the edges with 4 sepals, 4 petals and a globose ovary with a thick stigma divided into 4 to 8 lobes, one or two segments containing seeds are larger than the rest. The young fruits are light green in colour, ripening with pink and red streaks which spread and intensify to deep purple when fully ripe. The firm thick rind breaks easily when pressed with the hands to reveal pure white segments that provide a stark contrast to the purple coloured rind. Sweet with a delicate tang, the segments literally melt in the mouth with an exquisite aroma making it a most popular fruit appreciated by all. It is a wonderful dessert fruit worthy of the name "Queen of Fruits".



Garcinia mangostana flowers are yellow-buff flushed pink round the edge



The immature *Garcinia mangostana* fruits are light green in colour with 4-8 wedge-shaped lobes to the stigma



Ripe Garcinia mangostana fruits are purple with green and crimson sepals



The pure white aril of Garcinia mangostana provides a stark contrast to the purple rind

The seeds are viable but are short lived. Seedling derived trees commence fruiting when trees are at least 15 years old. Because seeds are nucellar there is little diversity but different yields and fruit qualities exist.

Propagation is by seed or grafting. Node to node wedge grafting has proved most successful but budding is sometimes successful. Grafted plants fruit earlier with some clones fruiting at about 3 years. Young trees require shading. Mature trees yield 500 to 1,500 fruits.

Nutrient composition of Garcinia mangostana

						Nut	rient	com	iposi	tion	per	100 g e	libl	e poi	rtior	1	
	Composition								Minerals Vitamins								
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	Ca (mg)			Na (mg)	K (mg)	* Carotene (ug)		B1 (mg)	27	Niacin (mg)	
34	87.6	0.6	1.0	5.6	5.1	0.1	7	13	1.0	7	45	0	0	0.03	0.03	0.3	4.2
				<u> </u>	0.1-1.75		-									*	ngg

Garcinia nitida Pierre Kandis (Malay, Iban)

The *kandis* grows wild in riverine areas in Sarawak. The tree is similar to the kundong in many ways except that the fruit is more oval, yellowish orange when ripe and the flesh is always sour. It is mainly used in dishes that require sour taste such as fish and curries. Dried skin is used as a sour relish and can be used as a substitute for jawa (Tamarindus asam indica). The ripe fruits can be blended and mixed with sugar for making jam or drinks.

It is propagated from root cuttings.



A Garcinia nitida tree is similar to Garcinia parvifolia in many ways

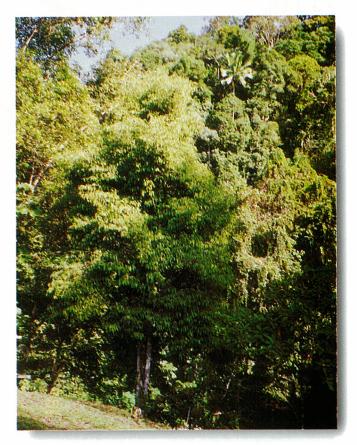




Ripe Garcinia nitida fruits and longitudinal section

Garcinia parvifolia Miq. Kundong (Malay, Iban)

The kundong is found growing in interior valleys and alluvial flats in Sarawak. It is a handsome tree with a growth habit similar to the mangosteen. It produces immature fruits green in colour which ripen to a glossy cherry red colour. The pulp is white and tastes sourish sweet to sweet with a fruity fragrance. The rind like young fruits are always sour and are used as an ingredient in curries and fish dishes. The young fruits and rind are sliced into thin pieces and sundried into a fig brown product that is sometimes sold in the market. Its other uses are similar to those of Garcinia nitida.



A mature kundong (Garcinia parvifolia) tree



Unripe fruits of *Garcinia parvifolia* are yellowish green while ripe fruits are cherry red in colour

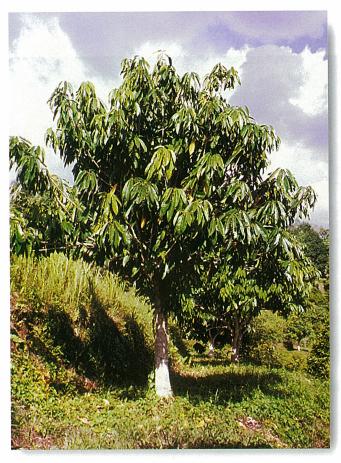


Ripe *kundong* fruit cross sections showing red rind, yellow pulp and white seeds

EUPHORBIACEAE

Baccaurea angulata Merr. Belimbing hutan (Malay), Ucong (Iban)

Baccaurea is a genus of trees found from India to the Pacific, chiefly Malaysia. The ucong is indigenous to Borneo. The tree grows to a height of about 8 m and is profusely branched. It has attractive colourful flowers and fruits and can be used as an ornamental plant. Numerous yellow flower spikes are produced from the trunk and branches developing into dark purple young fruits that ripen to a bright red colour. Each angular fruit is about 6 cm long and on breaking the thick skin transversely will reveal a white pearly pulp not unlike that of the rambai. The pulp is juicy, sourish sweet but sticking to the seeds. A thin membrane covers each segment. It has a flat seed in some segments. The chilled juice from the pulp is a delicious thirst quencher with commercial potential. It can be made into a cordial. The skin is sour and can be mixed with salt to make a pickle or sugar or a sweet preserve or jam. It can also be made into a drink.



A Baccaurea angulata tree grows to a height of 8 m and is profusely branched



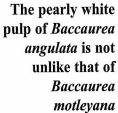
Numerous yellow flower spikes are produced from the trunk and branches



Excellent fruit set results in heavily laden Baccaurea angulata trees



The dark purple young fruits of *Baccaurea angulata* ripen to a bright red colour





Nutrient composition of Baccaurea angulata

Minerals Composition Vit Cu Zn P K Ca Mg Fe Mn \mathbf{C} **Energy Moisture Protein** Fat CHO Fibre Ash (ug) (mg) (Kcal) (g) (mg) (mg) (mg) (mg) (ug) (ug) (ug) (%) (g) (g) (g) (g) 6 5 5.8 93 73.8 1.0 0.2 21.9 2.1 1.0 39 352 21 21 2.6 0.1

Nutrient composition per 100 g edible portion

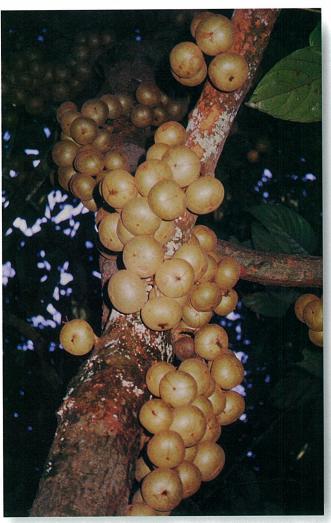
*ppm



Baccaurea angulata fruits on the tree are very attractive

Baccaurea bracteata Muell. Tampoi paya (Malay), Puak burung (Iban)

Tampoi paya is the most important of the three common species. It is indigenous to Borneo. The tree grows to 15 m height carrying numerous branches. The bark is bright fawn brown and scaly. Leaf blade small up to 17 x 8 cm. Numerous flower spikes will arise from the main trunk and branches resulting in numerous brown immature fruits which on ripening turn reddish brown. The round fruit is about 3-5 cm wide. The thick rind when pressed open reveals a glossy corn yellow pulp which is soft, sweet and has a pleasant fruity fragrance. Some pulp will always stick to the flat seed. It is an attractive fruit that can be developed further. It is a nutritious fruit being high in energy and rich in minerals. The Pagan races of Malaya make a fermented liquor from the fruit. This liquor is also made in Borneo and called *tuak tampoi*.



Immature fruits of *Baccaurea bracteata* are brown in colour



The corn yellow pulp of *Baccaurea bracteata* is sweet with a pleasant fruity fragrance

Nutrient composition of Baccaurea bracteata

Nutrient composition	per	100	g	edible	portion
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Composition							Minerals								
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
163	64.2	2.1	5.4	26.6	1.1	0.6	54	304	11	29	6	5	3.9	3.9	0.8

*ppm

Baccaurea costulata Miq. Kejira (Iban)

Kejira is similar to tampoi paya and puak except that the fruit is smaller and has a blood red pulp.



The blood red pulp of Baccaurea costulata

Nutrient composition of Baccaurea costulata

Nutrient	composition	per 100	g edible	portion
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	Composition						Minerals									
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)	
151	65.7	1.7	4.7	25.5	1.7	0.8	34	347	21	38	7	3	6.9	5.2	1.0	

*ppm

Baccaurea hookeri Gage Jelentik (Iban)

The tree produces small fruits in strings of about 20 cm length containing about 50 fruits. When ripe the skin turns yellowish orange and abscise easily. The pulp is deep orange in colour, juicy, sweet and fragrant. It is a favourite among kampung children who swallow the pulp whole together with the seeds.



A Baccaurea hookeri tree



Yellowish green spikes of Baccaurea hookeri

Baccaurea lanceolata Muell. Rambai hutan (Malay), Empaung (Iban)

Empaung is well distributed in tropical S.E. Asia but have been largely lost through timber harvesting. In Sarawak it can still be found growing in flood plains and riparian forests. The tree is similar to B. motleyana but the bark is pale grey in colour. The fruit spikes appear from the main trunk. The young fruits have attractive purple hues which ripen to greenish white. It is oval in shape, about the size of a golf ball. It has a thick rind enclosing a white pulp which is extremely sour with an attractive fragrance. It is used in cooking fish to provide the characteristic sour taste and flavour, much like kandis. Young fruits are eaten as ulam.



A fruiting *Baccaurea lanceolata* tree with numerous fruit spikes arising from the main trunk



The mature fruits of Baccaurea lanceolata are greenish white in colour

Nutrient composition of Baccaurea lanceolata

	2	Nı	ıtrie	nt cor	nposit	ion p	er 100	g edi	ble p	ortion	l				
	Compos	sition								Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
18	92.9	0.2	0.2	3.7	2.2	0.8	6	126	35	11	3	2	1.5	6.3	0.6

*ppm

Baccaurea macrocarpa Muell. Tampoi (Malay), Puak (Iban)

Puak is widely distributed in Borneo. The tree grown under full sunlight develops into a compact tree with numerous branches. Trees are small averaging 5 m in height. Flowers are numerous appearing both on the main stems and branches. Fruit set is excellent resulting in an amazingly large number of fruits crowded among the branches. The rounded fruits flattened at the apex and base are deep purple when immature, maturing into green and ripening into reddish brown colour. The fruit is 3-6 cm wide. The pulp is pearly white, soft, juicy and pleasantly sweet

with a fruity fragrance. The pulp always sticks to the seeds. *Puak* fruit can be made into a wine. It has the same potential for development as *B. bracteata*.

It is propagated from seeds.



The pulp of *Baccaurea macrocarpa* is pearly white, soft, juicy, sweet and with a fruity fragrance

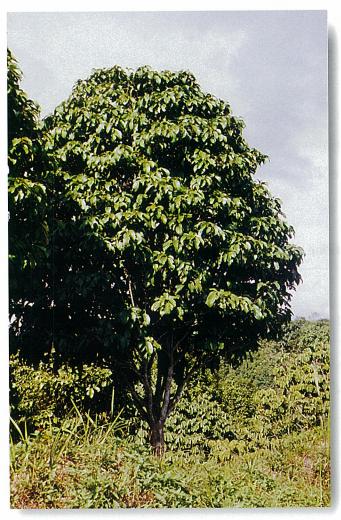
Nutrient composition of Baccaurea macrocarpa

		Nı	utrie	nt coi	mposit	tion p	er 100	g edi	ible p	ortio	1				
	Compo	sition		Han I				La l		Mine	rals				4
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
127	66.7	1.5	1.1	27.9	2.2	0.9	43	293	10	20	9	3	7.3	18.3	0.1

*ppm

Baccaurea motleyana Muell. Rambai (Malay, Iban)

Rambai is a native of Malaysia and Indonesia. The rambai tree grows to a height of about 10 m. with rather low, round, bushy, large-leafed crown. Trunk generally fluted at the base, bark fawn brown. Leaf blade 25 x 8 cm, elliptical. Numerous flower spikes appear from the trunk and main branches during the fruiting season. The yellow fragrant flowers are pollinated by insects forming strings of small greenish fruits. Ripe fruits are yellowish brown in colour. The rind encloses the pulp which is translucent white in colour, soft and juicy and tastes sour to sourish-sweet. The pulp is enclosed in thin membrane and always adheres firmly to the small flat seed. Villagers sometimes process the sour fruits into natural vinegar.



The Baccaurea motleyana tree grows to a height of about 10 m



Baccaurea motleyana usually fruits heavily when in season



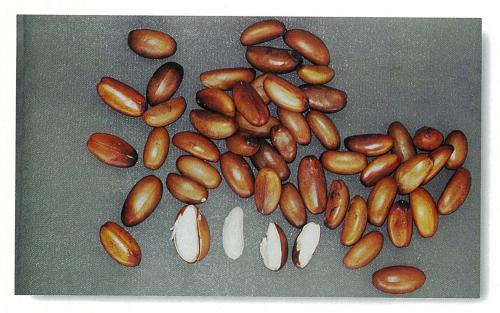
The translucent white pulp of *Baccaurea motleyana* is sour although some cultivars are sourish sweet

Elateriospermum tapos Bl. Perah (Malay), Kelampai (Iban)

This is a tall tree of over 35 m height found growing in hill forests of Malaysia and Java. The trunk is often fluted or slightly buttressed at the base. The bark is fawn brown. The leaf-blade 25 x 8 cm, narrowly oblong. Panicles 15 cm long carrying pale yellow flowers. The fruit is similar to that of *Hevea brasiliensis* but larger. The ripe fruits fall to the ground where they are collected. The shiny brown seeds are large, about 5 cm long. It has similar properties to *Pangium edule* containing the toxic prussic acid which needs to be destroyed by boiling or roasting before consumption. It is however very nutritious with high oil, protein and mineral (phosphorus, potassium and calcium) content. It can also be pickled in salt solution or fermented into a paste (as in *keluak* which is fermented *kepayang* seed). The oil extract can be used as cooking oil.



Elateriospermum tapos is a tall tree of over 35 m height



The seeds of Elateriospermum tapos are large, about 5 cm long

Nutrient composition of Elateriospermum tapos

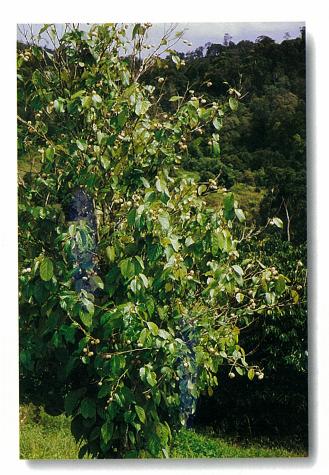
		N	utrie	nt co	mposit	tion p	er 100	g edi	ible p	ortion	1				
	Compos	sition								Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
379	36.7	13.6	28.0	18.4	1.1	2.3	246	544	189	76	22	27	9.4	29.0	10.3

*ppm

Ostodes sp. Merenti (Iban)

Ostodes is a small genus of shrubs or trees of the family Euphorbiaceae found in tropical Asia and Malaysia.

This is a medium-sized tree belonging to the same family as the rubber tree. It bears bunches of fruits in terminal branches. The immature fruit is creamy white ripening to greyish colour. Fruits are harvested at early maturing stage as the nuts of those that have split open and fallen to the ground are said to have a bitter taste. The fruit skin is removed and the two nuts inside are boiled with a little salt. The thin shell of each seed is easily broken to reveal a round, white kernel which is good eating with a nutty flavour. The seeds are eaten as a delicacy like roasted groundnut. The seeds can also be preserved in brine.



Ostodes sp. is a medium-sized tree of the rubber tree family



Immature Ostodes sp. fruits are creamy white ripening to greyish colour.



The white kernel of Ostodes sp. is protected by a thin black shell

Nutrient composition of Ostodes sp.

	Composition									Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
369	42.9	11.3	34.8	7.6	1.2	2.2	200	342	131	86	27	5	12.6	59.9	5.2

*ppm

Ptychopyxis grandis Airy Shaw Bedulang (Iban)

Ptychopyxis is a small genus of trees of the family Euphorbiaceae, found in Sumatra, the Malay Peninsula, and Borneo.

P. grandis is a small tree with few branches carrying large leaves. Flowers appear from the main stem and branches in groups, resulting in crowded bunches of fruits ranging from one to more than ten. Immature fruits are purplish brown in colour ripening to attractive shiny dark red. The thick rind contains large seeds with thin white pulp.



Ptychopyxis grandis is a small tree with large leaves



Immature fruits of Ptychopyxis grandis are purplish brown in colour



Ripe fruits of Ptychopyxis grandis are attractive shiny red in colour



The thick rind of *Ptychopyxis grandis* contains large seeds with thin white pulp

FAGACEAE

Castanopsis foxworthyi Schottky Berangan paya (Malay), Berangan lingkau (Iban)

Castanopsis refers to the chestnut of tropical regions. It is a large genus of trees found in tropical Asia and Malaysia. It is usually found growing in lowland forests. It bears heavy crops of fruits in compact clusters on terminal branches. Each fruit is covered with a thorny skin containing several small nuts. The nuts can be consumed raw, boiled or roasted as a snack. There are many species with different fruit types and nut sizes It is nutritious. Berangan has commercial potential. C. inermis, C. wallichii and C. costata give the best nuts among the Malayan species. In the Dutch Indies there are six species with edible nuts.

C. foxworthyi occurs naturally in Indonesia and Malaysia. It is very common and widely distributed in Sarawak in mixed dipterocarp, peatswamp, *kerangas* to montane forest to 2,100 m. Tree up to 30 m tall, 60 cm diameter, non-coppicing. Bark smooth, blackish brown. Leaves elliptic or lanceolate, 7-12(-16.5) x 4-7.5 cm.

Inflorescences male and female. Male inflorescences 7-15 cm long. Female inflorescences 8-10 cm long. Female flowers in clusters of 3 along the rachis. Cupules subglobose, 3-5 x 2-3 cm, densely pubescent, sparsely spiny. Nuts 3 in each cupule, ovoid, 1-2 cm across. The nuts are edible and nutritious with high values for energy, protein and minerals.



Castanopsis foxworthyi is a large tree



Terminal inflorescence of Castanopsis foxworthyi



Castanopsis foxworthyi bears heavy crops of fruits in compact clusters



Each Castanopsis foxworthyi fruit is covered with a thorny skin containing several small nuts



The nuts of *Castanopsis foxworthyi* can be consumed raw, boiled or roasted as a snack

Nutrient composition of Castanopsis foxworthyi

Nutrient composition per 100 g edible portion

- :	Compos	sition								Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
261	35.6	2.7	0.6	60.6	0.0	0.5	32	277	13	90	9	58	5.8	2.6	2.3

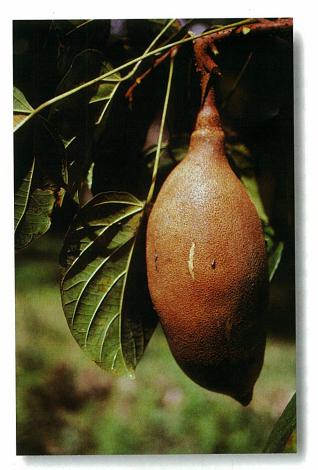
FLACOURTIACEAE

Pangium edule Reinw. Kepayang (Malay, Iban)

Pangium is a small genus of trees found in Malaysia and Papuasia. The kepayang is a large tree reaching heights in excess of 40 m. It has large heart-shaped leaves. It is found in the riparian forests of Sarawak. The Sarawak Ministry of Agriculture tried to promote the planting of this fruit without much success. The flowers are small with yellowish white colour. The fruit that results is large weighing from 1 - 1.5 kg. It is brown in colour and looks like mawang but has a nipple at the end. Each contains up to 20 seeds enclosed in a yellowish pulp. Each seed weighs about 10 g. The tough seed coat is veined containing a kernel that is relished by local people. The kernel contains a highly potent poison hydrocyanic acid which must be removed during processing to render it safe to consume. Processing involves boiling the seeds in water for at least three hours. After removing the seed coat, the kernels are soaked in water overnight for several nights. The water should be changed every night to ensure that all the poison is removed. The kernel is cut into smaller pieces and cooked with meat or fish. It is crunchy with a nutty taste. Another favourite processing method is to ferment the boiled seed in wood ash for about two months to become keluak. This results in the breakdown of the kernel into a thick, dark, oily liquid used for cooking with fish or meat. It is a very nutritious fruit with high values for energy, protein, fat, fibre, minerals and Vitamin C.



Pangium edule is a large tree reaching heights in excess of 40 m



The brown fruit is large weighing 1-1.5 kg

The kernel can be heated and pressed to extract a cooking oil high in oleic and linoleic acids. The young leaves are cut into small pieces and used in the preparation of *kasam* (preserved meat). Sometimes the bark and leaves are pounded and used as a fish poison.

It is propagated from seeds.

Nutrient composition of Pangium edule

		Nu	ıtrie	nt cor	nposit	ion p	er 100	g edi	ble p	ortion	ı				
	Compos	sition	71 3							Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
227	57.7	7.3	20.2	4.1	9.6	1.1	30	401	42	97	21	47	3.4	14.0	19.0

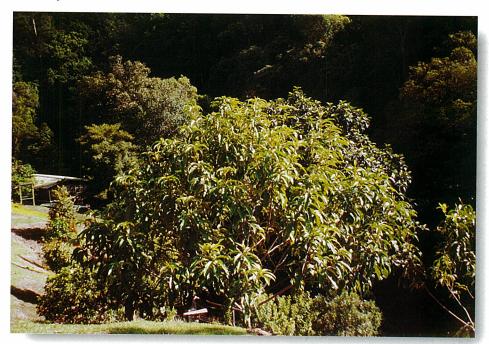
LAURACEAE

Litsea garciae Vidal Engkala (Malay, Iban)

Litsea is a large genus of trees found in tropical Asia and eastwards to Australia and the Pacific. The *engkala* tree is found in the wild growing on hill as well as lowland areas of Sarawak. It is commonly cultivated in rural villages. It belongs to the same family as the avocado (*Persea americana*).

It is a medium-sized tree with long brittle spreading branches. This seasonal fruit produces numerous small yellow flowers on secondary and tertiary branches. The young fruits are pale green in colour ripening to pink or pinkish or greenish white depending on the variety. Each fruit is about the size of a golf ball held by a prominent cup-shaped receptacle. It has a thick skin and thin white pulp surrounding a large brown seed. For eating, the fruit is softened by treating with lukewarm water for about 10 minutes. Tapping the fruit firmly with a spoon will produce the same result. It is usually eaten with a pinch of salt to enhance its taste and flavour. It tastes a little like *dabai* or avocado except that it is sweetish and has a slight mint flavour. Unripe fruits are sometimes preserved in vinegar or salt solution. Two varieties are recognised. The *bulan* is larger but less tasty while the *bintang* is smaller but richer in taste. It is nutritious with high energy, fat and mineral content.

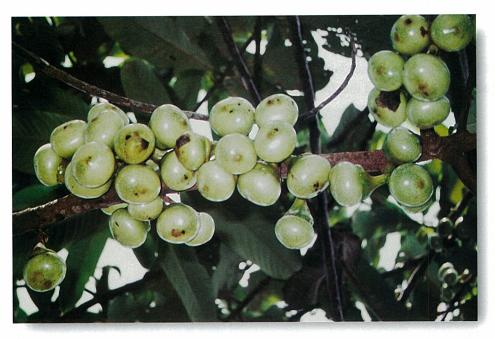
It is propagated from seeds or coppice shoots but the Sarawak Department of Agriculture has successfully marcotted this fruit tree.



The Litsea garciae tree is medium-sized with long brittle branches



Litsea garciae is a seasonal fruit which produces small yellow flowers on secondary and tertiary branches



The young fruits of Litsea garciae are pale green in colour



The ripe Litsea garciae fruit is about the size of a golf ball held by a prominent cup-shaped receptacle

Nutrient composition of Litsea garciae

		Nı	ıtrie	nt coi	nposit	tion p	er 100	g edi	ible p	ortio	1				
	Compos	sition								Mine	rals		•		
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
104	78.3	1.4	6.8	10.0	1.0	2.5	26	355	7	17	5	5	2.6	10.2	3.4

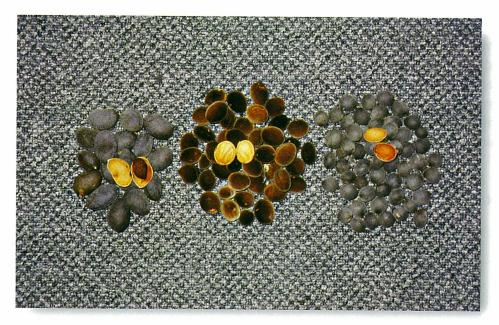
LEGUMINOSAE

Dialium indum L. Keranji (Malay), Enkeranji (Iban)

Dialium is a genus consisting of 27 species of trees found throughout the tropics. There are five Dialium species known locally as keranji growing wild in well drained lowland forests up to 250 m above sea level in Sarawak. It is a large tree of about 40 m height. The trunk is buttressed with dense branches and foliage. Leaves pinnate each with 7-9 leaflets each 6-10 x 3-5 cm. The flowers are small, white and fragrant and carried in panicles 10-20 cm long. The mature fruit pods are small, flattened, oval, with a dry, brittle, thin shell. It is velvety black in colour with sizes ranging from thumb-sized downwards. The pulp is thin, dry to caramel-like, brown to orange in colour and tastes sour to sweet. The single seed is light brown in colour. It is storable for several months. Four varieties are commonly found in the tamu during the fruiting season. Keranji papan is thumb-sized, and has a sweet caramel-like pulp. Keranji madu is smaller and also sweet. Keranji emplawak has a hairy brown pod, orange coloured pulp which is fluffy and sour. Keranji masam is small-sized. The black pod contains a fluffy orange pulp which is sour. Though high in potassium this fruit is small and not substantial enough to be important.



Immature two-year-old Dialium indum tree



Keranji papan (left), keranji emplawak (centre) and keranji masam (right)

Nutrient composition of *Dialium indum*

-		Nı	utrie	nt coi	nposit	ion p	er 100	g edi	ible p	ortion	1				
	Compos	sition				Į¥			12	Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	19.1	Vit C (mg)
126	63.8	1.2	0.3	29.7	0.2	4.8	29	438	4	4	11	18	3.3	9.1	1.2

*ppm

Parkia speciosa Hassk. Petai (Malay, Iban)

Parkia is a small genus of trees found all round the world in the moist tropics. Petai grows naturally in the lowland forests of Sarawak and is nowadays grown around villages. It is gaining popularity as a vegetable especially in Peninsular Malaysia where it has been domesticated and commercialised.

It is a large tree growing to a height of about 50 m. The trunk is buttressed with pinkish or reddish brown bark. It is non seasonal. Leaves with stalks 15-30 cm long, 10-19 pairs of side-stalks, leaflets 5-10 x 0.13-0.25 cm. The creamy white flowers are borne in microphone shaped heads hanging from stout green stalks 23-50 cm long. Long straight or curled pods develop hanging down from the heads in bunches. Each pod has a tough wall containing several to 18 seeds. The green seeds are eaten young or old, raw or cooked. Young shoots, the swollen

part of the flower stalk and young pods are eaten as *ulam*. They can also be pickled and preserved. The seeds have a strong taste and flavour with an aroma not unlike garlic. Claims abound that it has medicinal effect for controlling diabetes. *Kedaung* (*P. javanica*) is slightly bitter and used more as a medicine for colic. *Petai* dishes are gaining popularity especially in Peninsular Malaysia where it is often served in eating places fried with *sambal* and prawns. It is nutritious being rich in protein and minerals. *Petai* has been domesticated and commercialised in Peninsular Malaysia but is largely harvested from the wild and sold in the *tamu* in Sarawak.

It is usually propagated from seeds but budded seedlings are now available in the market.



Two-year-old Parkia speciosa plant



Microphone shaped inflorescence head of Parkia speciosa



Four varieties of Parkia speciosa found in the tamu

Nutrient composition of Parkia speciosa

		Nu	ıtrie	nt coi	mposit	tion p	er 100	g edi	ible p	ortio	ı				
	Compos	sition					Mine	rals							
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
91	76.0	6.0	1.6	13.2	2.0	1.2	115	341	108	29	22	42	36.7	8.2	-

*ppm

Pithecellobium jiringa (Jack) Prain Jiring (Malay, Iban)

Pithecellobium is a genus of trees found throughout the tropics of Asia and America. *Jiring* grows naturally in secondary forests in Sarawak and is sometimes cultivated around villages.

It is a medium-sized tree growing to a height of 25 m with a rounded crown. It is non seasonal. Leaves with a stalk 1.3-7.5 cm long, leaflets 6-28 x 3-10 cm, 2-3 pairs on each side-stalk, large, oblong-elliptic. The fluffy greenish white flowers are held in heads. It develops

into yellowish green pods which on maturity turns dark brown purple. The pod is always elaborately curled in two whorls. Each pod contains 3-6 rather large seeds. When the wall of the pod is removed, it reveals green seeds that are edible. The young seeds are eaten raw as *ulam* or boiled and eaten with steamed grated coconut. Fresh seeds have a strong, pungent taste and garlic aroma which may not be agreeable to many people. It is rich in proteins. It is claimed to have curative property against diabetes but excessive amounts may have deleterious effects on one's health. The *jiring* is usually harvested from the wild and sold in the *tamu*.



Pithecellobium jiringa is a medium-sized tree growing to a height of 25 m with a rounded crown



The helical dark brown purple pods of Pithecellobium jiringa



The large, light green seeds of *Pithecellobium jiringa* is eaten as an *ulam*

Nutrient composition of Pithecellobium jiringa

	×.	Nu	ıtrie	nt coi	mposit	tion p	er 100	g edi	ible p	ortio	1				
	Compos	sition								Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
100	74.0	5.5	0.6	18.2	1.2	0.5	51	177	23	26	10	5	25.5	9.6	23.2

MELASTOMATACEAE

Bellucia pentamera Naudin Jambu kerak (Iban)

This is a small tree found commonly growing along river banks and secondary forests in Sarawak and is most common in the Batang Ai area. It has low branches and large rounded leaves. The showy white flowers are carried in clusters along the branches. The round fruits are shaped like pomegranate (*Punica granatum*) fruits but is smaller measuring about 3 cm in diameter. Young fruits are green in colour ripening to a light yellow colour. Ripe fruits are thin skinned with a soft white pulp containing numerous tiny dark seeds. It has a refreshing sourish sweet taste and pleasantly fragrant but is never sold in the *tamu*. It is a favourite fish food. A decoctin of the leaves is drunk to cure stomach problems.



Bellucia pentamera is a small tree with low branches



Bellucia pentamera has showy white flowers



The ripe fruits of *Bellucia pentamera* are light yellow while the unripe ones are green in colour

MELIACEAE

Lansium domesticum Corr. Langsat, Duku, Duku-langsat, Dokong (Malay), Lensat (Iban)

The genus Lansium, which belongs in the family Meliaceae contains six or seven species native to India, Burma, Malaysia, Indonesia, Borneo and the Philippines. Langsat and duku are classified as a single species, Lansium domesticum but there are differences in tree form, fruit arrangement on the raceme, and the fruit itself. Another form, reported to be a hybrid, is called duku-langsat but appears to lack a precise definition. The dokong is similar to duku-langsat except that the pulp is more juicy and it originated from Thailand.

Langsat and duku are thought to originate in Malaya and possibly also in Sumatra and Borneo.

Langsat is a slender tree, 10-20 m high with a straight trunk, slender upright branches and an irregular or rounded crown. Duku tends to be less tall but has a wider crown. Leaves 30-45 cm long with 5-7 large, alternate stalked leaflets. Flowers are borne in racemes, 2 - 5 of these racemes grouped together directly on the trunk or large branches. These mostly ramiflorous racemes are erect at first but later droop after fruit set and during fruit development. Flowers have a sweet smell. In all studies conducted, pollen has been found sterile.



Lansium domesticum is a slender tree, 10-20 m high



Flowers of *Lansium domesticum* are borne in racemes grouped together in 2-5



The developing fruit of *Lansium domesticum* is pale green, ripening to pale muddy yellow of pale gold colour

Fruits are slight ovoid in *langsat* and round in *duku* and 30-50 mm and 40-50 mm in diameter respectively. There are commonly 15 - 25 fruits per raceme in *langsat* and 4-12 in *duku*. The developing fruit is pale green, ripening to a greyish buff, pale muddy yellow of pale gold but frequently with brown blemishes. The pericarp is thin in *langsat* and contains a sticky latex. *Duku* has a thicker pericarp (up to 6 mm) and no latex.

The skin of both fruit peels easily and cleanly from the clear, white, translucent and juicy aril. In *langsat*, taste varies from sweet to sour but *duku* is generally very delicate and sweet. The *duku* fruit consists of five separate segments up to two of which (usually the larger) contain soft green bitter seeds. *Langsat* has from 1-5 seeds which are firmly attached to the aril. Pollen grains of *langsat* are sterile and fruit and seeds are respectively autonomously parthenocarpic and apomictic in development.





Langsat fruit may be sweet to sour

Duku is generally very delicate and sweet



Dokong also known as duku - langsat from Thailand

The fruit may be preserved in syrup, by a short boiling, after removing the skin and confections are known to have been made in this way in Malacca. *Duku* preserved in syrup by a company in Singapore were shown in London at the Colonial and Indian Exhibition of 1886.

The timber is light-coloured, and not very hard; fine grained. Derived from wild trees, it is used in Java for tool-handles and sometimes for house-posts; it is durable, tough and elastic.

Langsat and duku can grow successfully in many soil types, but for best performance a well-drained sandy or clay loam rich in organic matter is preferred.

The long juvenile period of trees and low production are serious limiting factors to development of the crop.

Vegetatively propagated trees fruit in 3-4 years. Trees from seed commence bearing at 10-15 years. Yields are most often quoted as 5 kg in the ninth year from planting, and up to 30 kg per tree for 25-30-year-old trees. *Lansium* has been domesticated and commercialised and seedlings of specific good quality cultivars can be purchased from nurseries. It is not a particularly nutritious but popular fruit

Seeds can be planted but vegetative propagation is preferred. *Langsat* seedlings are generally preferred as rootstocks. Approach, cleft, whip or side veneer grafts, commonly give from 60-90% success. Air layers (large branches preferred) are usually made at the beginning of the wet season and detached 5-6 months later. Softwood or semi-mature terminal cuttings will strike under mist with a fair success rate.

Nutrient composition of Lansium domesticum

						Nut	rien	t con	apos	ition	per	100 g e	dibl	e po	rtio	1	
	Comp			7	N	/line	rals			1	Vita	mins	\$				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	Ca (mg)		Fe (mg)	Na (mg)	K (mg)	* Carotene (ug)				Niacir (mg)	
34	90.0	0.4	0	8.2	0.9	0.5	10	20	1.0	12	230	0	0	0.05	0.02	0.5	13.4
																,	*ppm

Sandoricum borneense Miq. Kelampu ai (Iban)

Sandoricum is a small genus of trees found in cultivation throughout Malaysia.

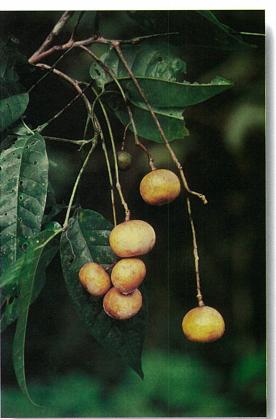
Kelampu ai are commonly found in nature growing along river banks with branches overhanging the river in Sarawak. It has strong penetrating roots holding the tree firmly on the precarious river bank especially during flooding. It produces an abundance of fruits which are small the size of longan fruit. It ripens to a yellow colour with white pulp. It is also a fish food.



Sandoricum borneense are commonly found in nature growing along river banks with overhanging branches



Flowers of *Sandoricum borneense* are small, hanging from loose panicles from leaf axils



A bunch of ripe Sandoricum borneense fruits



Sandoricum borneense fruits ripen to a yellow colour with a white pulp

Sandoricum koetjape (Burm. f.) Merr. Sentul (Malay), Kelampu bukit (Iban)

Kelampu bukit or sentul is a well-known Asian fruit of the family Meliaceae and is lately described as Sandoricum koetjape. It is native to Malaysia, Indonesia, Borneo and the Philippines. It is found growing naturally in the lowland forest.

Seedling trees are quick growing, reaching 30 m in height with a smooth straight trunk. Asexually propagated trees tend to be smaller (to 20m) with a more bushy habit of growth. In the dry season just prior to flowering the tree becomes semi-deciduous, and mature leaves turn yellow or red before dropping.

Flowers are small, up to 12 mm wide in loose hanging bunches arising from axillary buds along the branches. The flowers are lightly scented. Fruits are round, slightly flattened, 50-100 mm across with a thick firm and downy rind and slight lengthwise indentation. The external rind colour varies from dull to golden yellow, sometimes with a tinge of pink. It is edible and has a sour taste. The aril is relatively thin (up to 15 mm) but white, juicy and translucent, and surrounding and attached to 3 - 5 seeds about 15-20 mm long.

The *sentul* does not appear to require a high level of soil fertility. However, well-drained soils are preferred. If soil pH levels exceed 7 the tree can suffer severe iron deficiency.

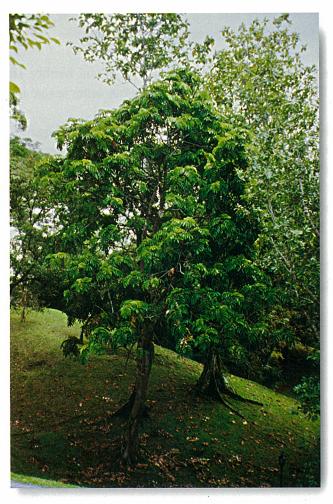
There is considerable variation in tree form, fruit size and aril quality amongst the various wild forms and also in seedlings from selected clones. Thailand appears to have been the leader in clonal selection and whilst there is still not a substantial amount of aril in the best selections, they are a vast improvement over selections in other countries. No yield data are available. The fruit has little commercial potential unless improved cultivars are selected with better tasting thicker aril.

Cultivars are propagated by air layers, approach, wedge, whip or side veneer grafts and by T or modified forkert budding. All methods give good results. It can also be propagated from seeds.

MORACEAE

Artocarpus anisophyllus Miq. Bintawak (Iban)

Artocarpus is a genus of trees found in south-eastern Asia and in the Pacific. A. anisophyllus is distributed in Indonesia and Malaysia. It is common in Sarawak. It grows in lowland and hill dipterocarp forests up to 600 m altitude. Tree up to 45 m tall, 90 cm diameter, buttresses spreading up to 2.5 m tall. Bark dark grey, smooth to dippled. Leaves spirally arranged, compound-imparipinnate. Leaflets oblong, ovate or lanceolate, 3.5-40 x 2-13 cm. Inflorescences axillary, males and females usually paired. Fruits subglobose, up to 11 x 8 cm, covered with cylindrical, rigid, minutely punctate, obtuse processes 6-8 x 1-1.5 mm, yellowish brown in colour, pulp orange, soft, sweet and with a mild aroma. Seeds ellipsoid, c.1.7 x 1 cm. The seeds can be boiled or roasted and eaten. It tastes like the chestnut. It is propagated from seeds.



Artocarpus anisophyllus is a large tree found growing wild in Sarawak



The Artocarpus anisophyllus fruit is medium-sized and yellowish brown in colour



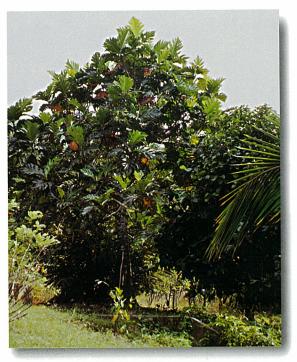
The pulp of Artocarpus anisophyllus has a unique orange colour

Artocarpus camansi Blanco Kemangsi (Malay), Pulor (Iban)

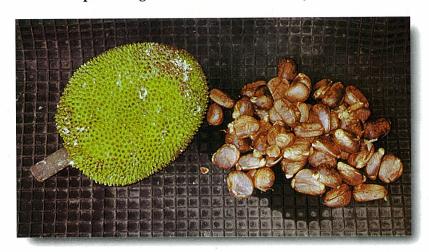
Pulor can be described as a seedy bread fruit or more simply breadnut. It is found in the lowland forest in the wild or is planted in rural villages in Sarawak. It is a medium-sized tree

reaching about 10 m. The flowers appear on terminal branches. The male inflorescences are club-shaped and drooping while the female inflorescences are rounded and upright. The oval fruits are about 20 cm in diameter and leaf green in colour. On ripening the rind turns to a brownish yellow colour. The young fruits are boiled, fried or roasted as a vegetable. The mature seeds are fairly large like a chestnut. The dark brown testa is removed and the seeds are boiled or roasted for food. It tastes like chestnut. It can be used as a starch substitute for making cakes and candies.

The seeds germinate readily and seedlings grow rapidly to produce fruits within four years.



Artocarpus camansi is a fast grower producing its first fruit within four years



Both the immature fruits (left) and seeds (right) of Artocarpus camansi are edible

Artocarpus champeden Spreng. Cempedak (Malay), Temedak (Iban)

The cempedak is widely distributed in S.E. Asia including Borneo. It is common in Sarawak. This medium-sized tree reaches a height of 20 m, 60 cm diameter; bole without buttresses. Bark dark grey-green, dippled to somewhat scaly. Leaves simple, spirally arranged, elliptic to oblong or obovate, 5-25 x 2.5-12 cm. Inflorescences solitary, axillary or borne on short leafy shoots on older branches or from the bumps on the main trunk. Male heads cylindrical to club-shaped, 3-5.5 x 1-1.2 cm. Female flowers with simple thread-like styles c. 1.5 mm long. The flowers appear from the trunk and main branches. Each healthy mature tree is capable of carrying more than 100 fruits in a season. Fruit sizes range from 10-35 cm x 10-15 cm. Immature fruits are light green ripening to yellowish with brown patches. A fully ripe fruit is soft to the touch. The rind can be cut open to expose the pulp which ranges in colour from pale yellow to dark orange and is juicy, sweet and fragrant. It is eaten fresh or fried as in plantain. Each pulp contains a seed which can be boiled or roasted for food. In Peninsular Malaysia, the flesh ripe and unripe is salted and used as a pickle called *jerami*. The young fruits are used as vegetables It is nutritious being rich in energy, calcium and Vitamin B. There is great variability in fruit characteristics and offers great opportunities for breeding and selection. It has been domesticated and commercialised.

It is propagated from seeds or vegetatively by budding.



Artocarpus champeden is a very productive tree carrying more than 100 fruits per season



Immature fruits of *Artocarpus champeden* are light green in colour ripening to yellowish with brown patches



The pulp of *Artocarpus champeden* which ranges in colour from pale yellow to dark orange is juicy, sweet and fragrant

${\bf Nutrient\ composition\ of\ } {\it Artocarpus\ champeden}$

						Nut	rient	com	iposi	ition	per	100 g e	libl	e po	rtior	1	
	Compo	osition		Ц				N	Iine	rals	1,1		,	Vitai	mins	3	
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)		Ca (mg)									Niacin (mg)	
117	66.7	2.5	0.4	25.8	3.4	1.2	40	5	1.1	25	246	80	13	0.16	0.15	0.5	17.7

Artocarpus elasticus Reinw. Tekalong (Iban)

A. elasticus is found in S.E. Asia including Malaysia. It is common in Sarawak growing in lowland to lower montane forests to 1,500 m. Tree up to 45 m tall, 90 cm diameter, with prominent buttresses up to 3 m tall. Bark grey-brown, smooth to slightly scaly. Leaves simple, spirally arranged, ovate or elliptic or oblong, 15-60 x 10-35 cm. Leaves of juvenile trees 2-3 times pinnatifid, up to 200 cm long. Inflorescences solitary, axillary. Fruits cylindrical, up to 12 x 6 cm, yellow-brown, covered by fleshy, whitish, short-hispid processes. The ripe fruit has a nauseous rancid smell. Seeds with white pulp.

The fruits are eaten by monkeys and squirrels and it is said that children will eat the pulp round the seeds but ripe fruits have the extraordinary nauseating smell of the *mengkudu* (Morinda citrifolia).

The ripe seeds can be eaten roasted. A solid oil is present in them, in very small quantities.



Artocarpus elasticus is a tall forest tree reaching 45 m high



The medium-sized Artocarpus elasticus fruit is cream yellow ripening to brownish, covered by shaggy woolly soft recurved spines

The bark is tough and strips readily in big sheets. It is used as clothing by jungle-folk, and by Malays for lining baskets and bins, for making house-walls and for string. The latex is most tenacious and is used for bird-lime. Various plant parts such as leaves, latex, bark have found uses in traditional medicine. The timber is used for boat making.

It is propagated from seeds.

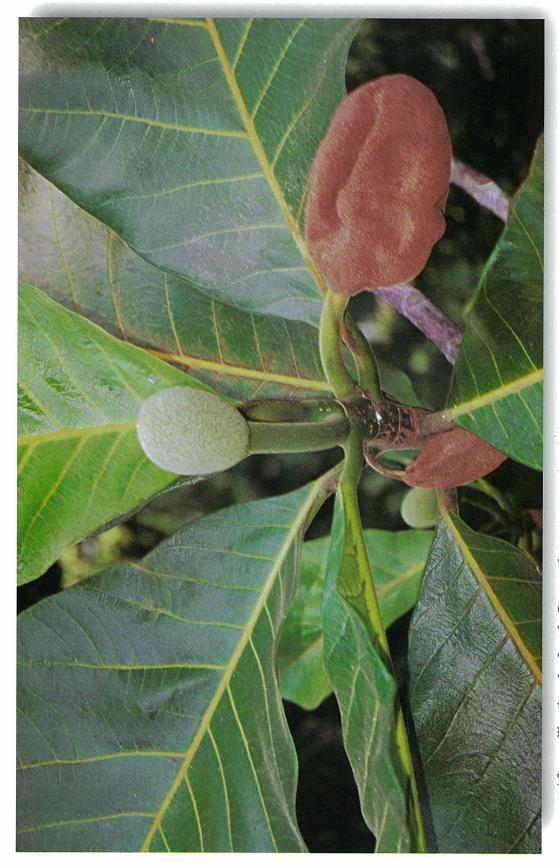
Artocarpus odoratissimus Blanco Terap (Malay), Lumuk amat (Iban)

The *terap* is a hardy plant found growing in primary and secondary lowland and hill mixed dipterocarp forests on sandy clay soils up to 1,000 m altitude in Sarawak. It is commonly grown in rural villages.

It is a fast growing tree that reaches heights of 30 m or more. Bark dark greyish brown, smooth. Leaves simple, spirally arranged, broadly elliptic to obovate, 16-50 x 11-28 cm. Leaves of juvenile tree pinnately lobed. Inflorescences solitary, axillary. Male heads ellipsoid to club-shaped, 4-9 x 2.5-3.5 cm. Female heads with pubescent peltate bracts; female flowers with exserted styles. After pollination, the female flower develops into a fruit while the male flower shrivels. Fruits subglobose, to 16 x 13 cm, greenish yellow, covered by closely set, rigid, cylindrical hispid-pubescent processes, 8-13 x 1 mm, fleshy part of perianth white, juicy, very sweet and aromatic. Seeds ellipsoid, c. 1.2 x 0.8 cm. It is monoecious producing both male and female flowers in the same plant. The small seeds are often boiled or roasted and eaten as a titbit. Fruits should be harvested when mature as ripe fruits have very poor keeping quality.



Artocarpus odoratissimus is a fast growing tree that reaches heights of 30 m or more



After pollination the female flower of Artocarpus odoratissimus develops into a fruit while the male flower shrivels



The young fruits of Artocarpus odoratissimus are yellow to green in colour



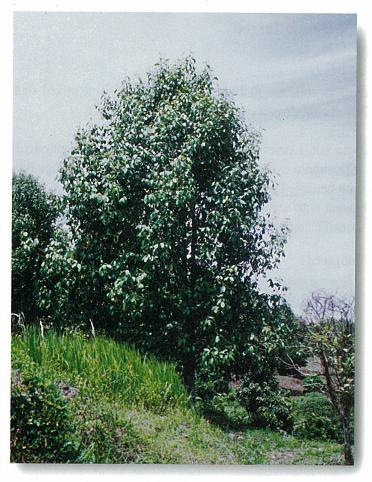
The ripe fruit of Artocartpus odoratissimus is light green to fig brown in colour

Artocarpus rigidus Bl. Tempunik (Malay), Pala munsoh (Iban)

Artocarpus rigidus is a medium-sized tree growing to 30 m height, found in Burma, Indo-China and Malaysia in lowland forest and open country. The stout trunk carries a dense, heavy, dark green spreading crown supported by several long stout erect branches. The leaf blade is obovate, elliptical, blunt or slightly tipped, stiff and rigid. Flower heads arise from leaf-axils.

Fruits 8-13 cm wide, round, thickly set with stiff conical spines (0.8 cm long), greenish yellow when immature turning to dull orange on ripening. The stalk is sunken as in apple. The pulp is orange and waxy containing seeds. The pulp has a pleasant sweet taste but is apt to give a rawness in the mouth. The seeds are edible. The fruit takes six months to ripen.

The timber is used for house beams, furniture and boat building. The latex is used in veterinary medicine for wounds



Artocarpus rigidus is a medium-sized tree growing to 30 m height



Immature fruits of *Artocarpus rigidus* are greenish yellow ripening to dull orange colour

Artocarpus sarawakensis Jarrett Pingan (Iban)

A. sarawakensis is endemic to Borneo. Found in lowland mixed dipterocarp forest on ridges, up to 300 m in altitude and secondary forests in Sarawak.

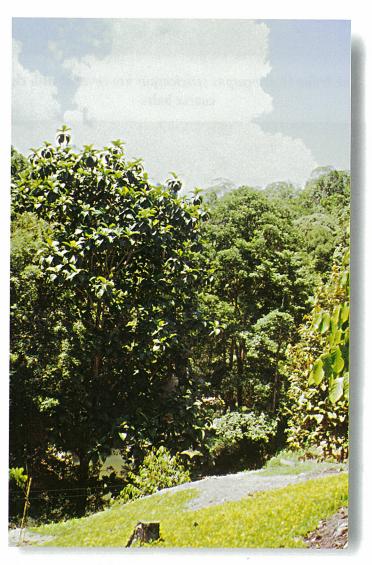
Tree up to 25 m tall. Leaves large, simple, spirally arranged elliptic 30-50 x 18-25 cm. Female flowers with simple exserted styles c. 2 mm long. Fruits subglobose, c. 5 cm across, surface covered with hardened cylindrical, obtuse hairy processes c. 5 x 2 mm, peduncle up to 5.5 cm long, pubescent with scattered long hairs. Seeds ellipsoid, surrounded by a sweet white pulp that is less aromatic compared to *A. odoratissimus*.



The sweet white pulp of Artocarpus sarawakensis is less aromatic compared to A. odoratissimus

Artocarpus sericicarpus Jarrett Terap bulu (Malay), Pedalai (Iban)

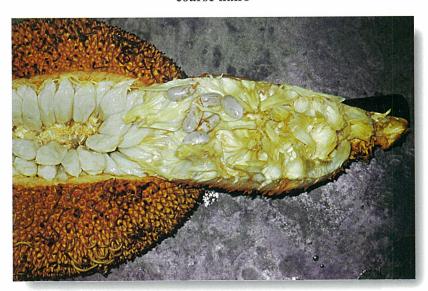
The *pedalai* is a large tree found commonly growing in the lowland dipterocarp forest in Sarawak. It bears medium- sized fruits covered with long rigid coarse hairs. Ripe fruits can be easily opened by removing the rind. The pulp is similar to *terap* in taste and aroma. The small brown seeds when fried results in a delicious crunchy titbit with a nutty aroma. The pulp is rich in energy and minerals while the seeds are rich in energy, proteins, fibre and minerals.



Artocarpus sericicarpus is a large tree found commonly growing in the lowland dipterocarp forest in Sarawak



The fruits of *Artocarpus sericicarpus* are covered with rigid coarse hairs



The white pulp of *Artocarpus sericicarpus* is soft, very sweet and aromatic

Nutrient composition of Artocarpus sericicarpus

Nutrient composition per $100\ g$ edible portion

	Com	position	ı							M	linera	als				
	Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)		Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
Fruit Seed	119 241	69.3 42.9	1.7 7.2	0.3 7.7	27.4 35.7	0.5 5.5	1.7 0.9	33 100	322 159	22 119	25 57	8 31	6	2.5 2.6	7.4 24.0	1.8

Ficus obpyramidata King Ara lempong (Malay), Engkunoh (Iban)

A very large genus of trees, or shrubs of the family Moraceae found all through the tropics, with a great abundance of species in south-eastern Asia and Malaysia. In this part of the world many of them start life as epiphytes, and, if vigorous enough, smother their hosts, after they have established a connection with the ground by means of descending air roots. Sometimes the air-roots become so bunched together, that they make a compound trunk; sometimes they are scattered as in the Banyan, in which they stand under the branches as prop-roots.

In Peninsular Malaysia there are about eighty species. Most of them are called *ara* with a more or less distinctive adjective.

The figs vary enormously in palatability from the best, such as those of the Mediteranean *F. carica*, the Philippine *F. ulmifolia*, and *F. roxburghii*, which can be converted into a pleasant jam, to figs which seem to be untouched by any bird or animal. Fig-trees produce fertile figs and gall-figs, mainly on different trees. The gall-figs are perhaps always less palatable than the seed-figs of the same species. Observers, who in future occupy themselves with their food value, should not forget this. It is reported of some species that they bear figs, which though more or less inedible when ripe, can be used as food before complete maturity. The small figs of several species serve as famine foods in India. Four species contain carbohydrates to the extent of about one-third of their dry weight. The young leaves of several species are eaten.

In Sarawak, *Ficus obpyramidata* are common especially growing along river banks. It bears edible fruits. It is rich in energy, protein, fibre and minerals especially potassium. The green mature fruits are occasionally sold in the *tamu* and purchased for eating as *ulam*.

Figs (*Ficus* spp.) are prime food sources for birds especially the eight protected species of hornbills. *Ficus* species are also protected in Sarawak. It is also eaten by orangutans, other primates, small mammals and fish.

Nutrient composition of Ficus obpyramidata

		Nu	utrie	nt coi	mposit	ion p	er 100	g edi	ible p	ortio	1				
	Compo	sition								Mine	rals			-	
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	· * Cu (ug)	* Zn (ug)	Vit C (mg)
176	50.9	6.3	4.8	26.8	6.8	4.4	192	1473	182	88	83	6	5.9	26.0	-

Ficus obpyramidata is a small dioecious tree up to 10 m tall. Bark greyish brown. It is found commonly growing by streams and rivers in the forest and very abundant by rivers in open country as *belukar* and rice fields up to 1,300 m altitude.

The figs of this species is larger than those of other Malaysian species and most like the Mediterranean Fig tree. The leaves are abovate or nearly rhombic in outline 14-20 x 4.5-1.5 cm. The figs are 4-5 cm wide, pear shaped, massive stalked, the mouth sunk in the lower end, ripening yellow to dingy brownish ochre.



Ficus obpyramidata is a small tree growing along rivers bearing fruits which serve as a fish food





The immature fruits of *Ficus obpyramidata* are green ripening yellow to dingy brownish ochre



The green mature fruits of *Ficus obpyramidata* are occasionally sold in the *tamu* for use as *ulam*

MUSACEAE

Musa acuminata var. microcarpa Colla Pisang kera (Malay), Lengki (Iban)

In Sarawak two species of wild bananas are commonly used as vegetables in rural communities. They are pisang kera (Musa acuminata) and pisang lengki or gentu (M. hirta). The parts eaten are the soft young pseudostem, rhizome, very young fruits and the male inflorescence. The bunch of male flowers, which tops the inflorescence, known to the Malays as kelepak jantong (leafy wrapped heart), is cooked and eaten. It has a slightly astringent and bitterish sweet taste but is relished as an ulam or boiled, roasted or cooked in coconut milk. It is rich in potassium. The female flower bud can be eaten as a salad but this is rarely done. The female flowers develop into fruits and are light green in colour, short, broad, flattened and hairy with a thick rind and little pulp which is seldom eaten. The fruit bunch is held vertically on a stout stalk.



A wild banana pisang lengki or gentu (Musa hirta) where the pseudostem, rhizome, very young fruit and male inflorescence are eaten

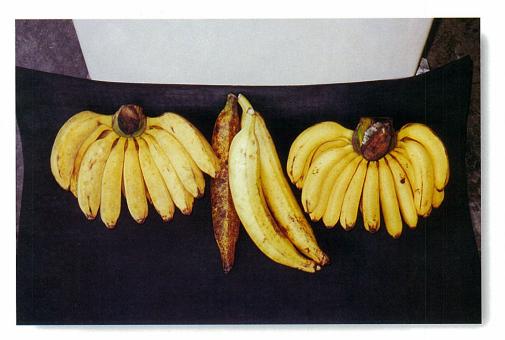
Nutrient composition of Musa hirta inflorescence

Nutrient	composition	per 100	g edible	portion
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Composition							Minerals									
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg	
18	93.3	0.8	0.6	2.3	1.2	1.8	22	545	20	20	32	36	1.1	3.7	0.3	

*ppm

The two main commercial uses of banana are dessert fruit and fibre. There are many races of dessert banana - close to a hundred but this number is inflated by local names of the same race in different languages. With the present technology of molecular biology the identity of banana species and races can be elucidated once and for all. *M. acuminata* is the Wild or Monkey Banana of the eastern part of Malaysia, mentioned above as having contributed perhaps towards the building up of the table banana. Kurz thought that forty-eight cultivated races had been derived more or less from it, including among them *pisang mas*, *pisang raja*, and *pisang susu*, but they are regarded here as races of *M. paradisiaca*.



Ripe fruits of three cultivars of Musa species

The Gros Michel or Cavendish is the most important worldwide and is the main variety generally traded. The Manila hemp (*M. textilis*) is one of the finest and strongest of structural fibres produced in the plant kingdom. It is very elastic, light and durable and is not damaged by salt or fresh water and thus find uses as ship's ropes and strong sacking and preparation of paper mache.

Bananas are by far the most important of the tropical fruits and are used daily by a large majority of the dwellers in the tropics. In some areas they are a staple article of diet, and bananas are found growing in almost every type of tropical environment; even in the more arid areas where other types of fruit are largely unobtainable. Bananas grow well under irrigation and provide a supply of fruit throughout the year. They must have been among the first plants cultivated and the origin of the crop is thus obscure. During the last 100 years or so an enormous export trade has been built up largely owing to post harvest technology which assured quality fruits reaching the consuming countries.

The fruits eaten as dessert, without any cooking process, are called bananas, whilst the more starchy types which need cooking before they can be used as vegetables are called plantains. There is no specific difference between these two groups of varieties. All the cultivated types are members of the genus *Musa*, a genus of between sixty and eighty species of monocotyledons, which belongs to the family Musaceae.

The origins of the cultivated types are not as yet fully worked out. Most of the cultivated bananas and plantains are triploid, producing their fruits parthenocarpically and hardly ever producing seeds. They must have been propagated vegetatively ever since they first originated and from an examination of the wild species it seems clear that all the cultivated types are most closely related to M. acuminata and M. balbisiana. These two wild diploid species have a wide range of distribution, occurring from Ceylon through India and Burma to Malaysia. They cross fairly readily and both in hybrids and in the two species, triploid forms could have been derived by the production of diploid gametes and their subsequent fertilization by a normal haploid gamete. The edible triploid varieties occurring throughout south-eastern Asia can be divided into three groups, those which show definite affinities with M. acuminata, those which have evidently been derived from M. balbisiana, and a third group which shows affinities with both these wild species. To those many varieties, both of plantains and bananas, which have been derived from M. acuminata the specific name M. paradisiaca should be applied. The name M. balbisiana is retained for those few varieties, mainly Indian, which have obviously derived from the wild M. balbisiana, and for hybrids between the two wild species which have developed as triploids the name M. sapientum is used. The dwarf type of banana grown in the Canary Islands, and known to the trade as the Canary banana, is often referred to in the literature as M. cavendishii, but since it is closely related to the main Central American variety, the Gros Michel, being merely a dwarf form, it must be considered as a variety of the species M. paradisiaca.

Bananas and plantains are large herbaceous perennials with a short underground rhizome producing aerial shoots from lateral buds on the rhizome. The rhizome produces a mass of adventitious roots which are not extensively developed either laterally or vertically. The aerial part of the plant consists of a number of large shoots forming a clump. The aerial shoot is called the pseudostem and grows to a height of 3 - 10 m, depending on variety and conditions.

New leaves are continually forced up through the centre of the pseudostem and expand at the top where the leaf blades form a handsome crown. Banana leaves are light green in colour, smooth and glossy and attain a very large size, often being used as temporary shade. The final leaf to emerge through the pseudostem is much smaller than the rest and curves to protect the developing inflorescence. The terminal bud of the aerial shoot, having produced a number of leaves, develops directly into the inflorescence which is carried up on a long smooth unbranched stem, through the centre of the pseudostem, emerging at the top and bending over under the weight of the large inflorescence. Banana fruits develop parthenocarpically from the female flowers and contain no seeds, Flowering takes place at any time from seven to nine months after the suckers have been planted. The fruit is elongated more or less round in cross-section but with the triangular form of the ovary still visible. Inside the skin lies the pulp, a tissue of large cells filled with starch which is partially converted to sugars during the ripening process. It is very nutritious being high in energy, vitamins and minerals especially potassium.

It is propagated from suckers or by tissue culture.

Nutrient composition of Musa sapientum

						Nut	rient	con	posi	ition	per	100 g ed	lible	e po	rtior	1		
Composition							-	N	Iine	rals		Vitamins						
Energy (Kcal)	Moisture	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	Ca (mg)			Na (mg)		* Carotene (ug)		B1 (mg)		Niacin (mg)		
100	73.0	1.4	0.3	22.9	1.7	0.7	0	3	0.2	10	342	380	63	0.04	0.08	0.5	8.3	

MYRTACEAE

Eugenia aquea Burm. Jambu air (Malay), Jambu ai (Iban)

A small crooked fruit-tree, wild in southern India and eastern Malaysia, cultivated widely in south-eastern Asia for the sake of its slightly aromatic, white or rose-pink fruits, which are eaten to relieve thirst. Sometimes it is used for making *rojak*. Like it, *E. jambos* is equally a rose-apple, but with an elongated fruit, and a more distinct rose flavour.

The tree is small growing to 5-13 m in height with low branching with dark green glossy leaves 15 cm long. Flowers are axillary or terminal appearing in clusters, white or sometimes red in colour and fragrant. The fruits are pyriform, with diameters of 2-4 cm. The skin is thin, shiny, white, pink, red or green in colour and easily bruised. The flesh is watery, sour to sweet, or tasteless containing 0-3 seeds. It contains a fair amount of Vitamin C.

The fruit enters into a ceremonial salad used after childbirth. The bark is astringent, and is useful for thrush. The timber is hard, but only suited for quite small objects.

It is vegetatively propagated.



Eugenia aquea is a small tree growing to 5-13 m height with low branching



Flowers of *Eugenia aquea* are axillary or terminal appearing in clusters white in colour and fragrant



Eugenia aquea fruits exhibit great variability in appearance and quality



Ripe fruit bunch of Eugenia aquea (var. Bidor)



The flesh of *Eugenia aquea* is white, watery, sour to sweet or tasteless containing 0-3 seeds

Nutrient composition of Eugenia aquea

	Nutrient composition per 100															1		
Composition								N	Iine	rals		Vitamins						
Energy (Kcal)	Moisture (%)	Protein (g)	Fat	CHO (g)	Fibre (g)	Ash (g)		P (mg)	Fe (mg)	Na (mg)		* Carotene (ug)		10000		Niacir (mg)		
17	95.0	0.8	0.1	3.1	0.8	0.2	2	5	0.2	1	48	7	1	0.04	0	0	16.7	

Eugenia malaccensis L. Jambu bol (Malay), Jambu lipa (Iban)

A fruit-tree reaching 20 m in height, but fruiting freely at 7 m. A native of Malaysia apparently, though two of its Malay names - *jambu melaka* and *jambu kapal* suggest import, but they possibly only indicate an introduced race. A race has been found in the Philippine Islands with 90 per cent of the fruits seedless. At present it is grown in tropical America, Africa and the Pacific. Its dispersal is limited by its need of rain almost all the year round.

It is a low branching tree with large leaves of 15-35 cm length. The flowers are pink coloured and appear in clusters on the larger branches. Fruits have different sizes, shapes and colours. The ripe fruit may be white, red striped or red. The larger fruits have a large seed while small fruits are seedless.

The fruit is sour, sourish sweet or tasteless, but juicy, and is eaten raw as *rojak* or cooked. It may be used effectively with stronger tasted fruits in making jams.

The timber is hard, but usually too small or crooked for use.

It is propagated from seeds.



Eugenia malaccensis is a fruit tree reaching 20 m in height



The flowers of *Eugenia malaccensis* are pink coloured and appear in clusters on the larger branches



A bunch of ripening fruits of Eugenia malaccensis



The larger fruit of Eugenia malaccensis has a large seed and white flesh

Eugenia polyantha Wight Jambu hutan (Malay), Bungkang (Iban)

E. polyantha is found in Burma and southwards throughout Malaysia; it is found from the Thai border to Singapore.

A moderate-sized tree to 25 m high, with cylindric, rather open crown. Leaf-blades 8-13 x 3-6 cm. Flowers 0.8-1.25 cm wide, tiny, faintly scented white. Fruits 0.8-1.0 cm wide, small, round, or transversely oblong, often rather flattened, ripening cherry red to purple-black, pulpy.

The wood is fairly hard, but splitting on drying. It is used for house-building and is durable. In Sumatra, it is the least valuable of those *Eugenias* which are called *ubar*.

The bark is considerably used in the Dutch Indies for tanning fishing-nets, and for colouring mats. For the purpose, it is pounded in water; after straining, the split bamboos used for the matting are repeatedly dipped in the infusion over two days. Then they are immersed in mud to blacken. An extract of the bark is given in Java for diarrhoea, as, also alternatively an infusion of the leaves.

The bark, root, and leaves are used for poulticing for itch by the Malays. In the Dutch Indies, the young leaves are commonly used with food. They are aromatic from the presence of volatile oil; the leaves from cultivated trees are considered better than those from wild trees. In Sarawak it is used for cooking fish and meat in bamboo sections (*pansuh*). The fruit may be eaten but is small and insignificant. It is an important fish food.

It is propagated from seeds.



Eugenia polyantha is a moderate-sized tree growing to 25 m tall



The fruit of Eugenia polyantha is small ripening cherry red to purple-black

OLACACEAE

Scorodocarpus borneensis Becc. Bawang hutan (Malay), Sindu (Iban)

Scorodocarpus is a monotypic genus of the family Olacaceae.

Found commonly in Thailand, Sumatra, Peninsular Malaysia and Borneo, on slopes in primary and secondary mixed dipterocarp forest on clay loam soils, and occasionally in seasonally flooded alluvial forest.

Medium-sized to large tree, to 40 m tall, 80 cm diameter, all parts with garlic smell especially when crushed or cut. Crown small, dense, bole straight, to 25 m, occasionally with small, low buttresses. Leaves coriaceous, shiny green above. Inflorescences racemose, to 4 cm, rusty to greyish puberulous. Flowers white, c. 1.5 cm long, solitary or grouped in clusters of 2-3 along the rachis. Fruits globose, green, c. 5 cm across, peduncle 1 cm, pericarp thin and fleshy, endocarp woody with numerous vertical fibre-like hard strands. Seeds subglobose.

The garlic smell, present in the timber, is present also in the leaves, flowers and fruit. The jungle tribes use the leaves as a seasoning, they also eat the fruit. The leaves are rich in potassium.

Among the Pangan of Kelantan the fruit or an infusion of the bark, is given as an antidote for *ipoh* poisoning. *Ipoh* is a poison obtained from a tree (*Antiaris toxicaria*) used as a blowpipe dart poison. It gives a first-class timber, which is heavy, hard, dark purplish red-brown with a garlic-like odour when fresh and a peppery odour when dry.

It is propagated from seeds



The fruits of *Scorodocarpus borneensis* are globose, green, about 5 cm in diameter, the endocarp is woody with numerous vertical fibre-like strands.

Nutrient composition of Scorodocarpus borneensis leaves

		Nı	ıtrie	nt coi	mposit	ion p	er 100	g edi	ible p	ortior	1				
	Compos	sition				R				Mine	rals				
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	P (mg)	K (mg)	Ca (mg)	Mg (mg)	* Fe (ug)	* Mn (ug)	* Cu (ug)	* Zn (ug)	Vit C (mg)
93	66.5	3.7	3.6	11.6	13.7	0.9	46	405	0	33	0	20	0	10.0	3.5

OXALIDACEAE

Averrhoa bilimbi L. Belimbing besi (Malay), Belimbing masam (Iban)

Averrhoa is a genus of two shrubs or small trees found now throughout the tropics but of Malaysian origin. It is a mistaken idea to regard it as American as some have done so.

Averrhoa bilimbi, a small tree, native of Malaysia, but not of the wettest part, as it likes a climate which has dry seasons it associates in a wild state with teak.

It is a sparingly branched tree with a short trunk reaching heights of about 10 m. It has compound leaves with between 20 - 40 leaflets each 5-10 cm long. The sweet scented flowers are small and coloured pink or red are carried on the main branches. The green fruit is five sided and shaped like a small cucumber. It is between 5-10 cm long. The thin skin contains a soft, juicy pulp which tastes very sour. Embedded in the pulp are small seeds 8 mm long.

It is commonly cultivated for its acid fruits, which are cooked with sugar, or made into seasonings for eating with curries. The Malays prepare a pickle (sunti) from the fruit. They take it half-ripe, wash it, dust it with salt, allow it to wilt in a hot sun, and then submerge it in brine. It keeps for about three months. To candy the fruit takes a rather long time. The fruit can be made into a jam or pickle. A Javanese preparation known as rujak mricha is made from the fruit with pepper, and is taken to induce perspiration.

It is propagated from seeds and air layering.

Nutrient composition of Averrhoa bilimbi

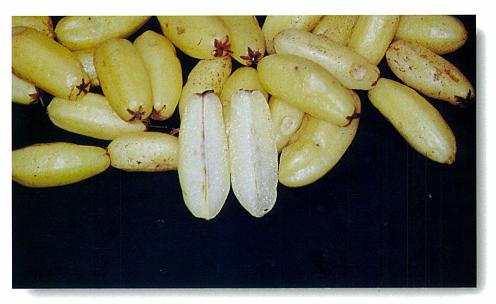
						Nut	rient	con	posi	ition	per	100 g ed	ldil	e po	rtior	ì	
Composition							N	Iine	rals		Vitamins						
Energy (Kcal)	Moisture (%)	Protein (g)	Fat	CHO (g)	Fibre (g)	Ash (g)	Ca (mg)									Niacin (mg)	_
26	94.2	0.7	1.3	2.8	0.7	0.3	12	1	0.4	4	80	229	38	0.01	0.08	1.2	15.7
																*	ppm



Averrhoa bilimbi is a small tree native to Malaysia



Red flowers and green immature fruits of Averrhoa bilimbi



The thin skin of *Averrhoa bilimbi* is yellow when ripe containing a white juicy pulp which tastes very sour

Averrhoa carambola L. Belimbing manis (Malay, Iban)

A shrub, or small tree found wild in South East Asia, and cultivated widely. It likes a climate which has dry seasons, and it associates with teak in Java.

The 5-12 m high tree has compound leaves with between 2-11 leaflets each 2-9 cm long. It is not seasonal and flowers profusely with clusters of small purple flowers several times a year. Fruit set is excellent and fruitlets need to be thinned out before wrapping. The green fruits ripen to light yellow to yellow orange colour depending on the variety. The fruit has a characteristic five angles giving the fruit its name of star fruit. Large fruits may reach 15 cm long. It has a thin skin with a juicy but crispy pulp which may be sour to sweet. It contains 10-12 avoid seeds 1 cm long. It is one of the local fruits with high Vitamin C and A content.

It prefers well drained soils of light to medium texture with pH of 5.0 - 6.5. The budded tree is low branching and short with height further controlled by topping so that it is easy to wrap the fruits to protect against fruit flies. Sometimes netting is used to keep out the pest. Spraying using insecticides is not advocated as it may result in high pesticide residue in the fruit.

It has several imperfectly isolated, cultivated races, with sweeter and larger fruits than the wild plant, and it is these which have been taken overseas. This *belimbing* is best eaten stewed with sugar as it is sour, but some forms are sweet enough for dessert. It is roasted with food, in Goa and is called *carambola*. The fruit is very good for tarts, especially those of the sweeter races which may be distinguished as *belimbing manis*. It can be made into jams, confectionary

jelly and candy. The juice is a refreshing drink. It is also used in fruit salads or *rojak*. The Malays salt it as an *acar* and boil it in syrup as a *manisan* (sweetmeat), treating it as described under *A*. *bilimbi*. The flowers are pleasantly acid and are used in salads in Java.

With proper selection for high yielding and quality fruits and advanced post harvest technology dessert *carambola* has the greatest potential for development. In Malaysia, two cultivars known as B10 and B17 are among the best. The attractive yellow colour coupled with the unique star-shaped cross section make it very attractive on the serving table.

It is vegetatively propagated by budding or marcotting.

Nutrient composition of Averrhoa carambola

						Nut	rient	con	posi	ition	per	100 g e	libl	e po	rtio	n		
Composition								N	Iine	rals		Vitamins						
Energy (Kcal)	Moisture (%)	Protein (g)	Fat (g)	CHO (g)	Fibre (g)	Ash (g)	Ca (mg)		Fe (mg)	Na (mg)		* Carotene (ug)				Niacir (mg)		
24	92.0	0.7	0.1	5.0	1.8	0.4	5	12	0.3	6	99	293	50	0.07	0.07	1.1	25.8	



Averrhoa carambola is a shrub or small tree found wild in South East Asia



Immature fruits of Averrhoa carambola are dark green in colour



On ripening the fruits of *Averrhoa carambola* turn light yellow to yellow orange in colour depending on the variety