

## The Gymnosperms of the Malay Peninsula.

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The three existing groups of the Gymnosperms, Coniferae, Gnetaceae and Cycadeae are represented in the Malay peninsula but not by any means abundantly nor do any form a conspicuous feature in the flora.

The Conifers, more abundant in temperate than in warm climates, are almost confined to the group *Taxaceae*. We have one species of the *Araucarieae*, *Agathis*, and of *Taxaceae* including the group *Podocarpeae*, seven species of two genera, *Dacrydium* and *Podocarpus*.

Now the geographical distribution of these conifers is of some interest. In the forests of the low country up to nearly 1000 feet we have only three species; *Podocarpus Wallichianus*, *P. neriifolius* and *P. polystachyus*, the latter two closely allied. The two first are natives also of Khasiya, and the tropical Himalaya. This section of Podocarps with yew like leaves is widely scattered over the whole of the tropics of both hemispheres descending into colder regions of the south Chile, Australasia, Japan, South Africa.

When we get to the mountain regions we have *Agathis* (or *Dammara*), *Dacrydium elatum*, *D. falciforme* and *D. Beccarii* and the very distinct *Podocarpus cupressinus*, with foliage of two forms very unlike anything in the Indian region. All these occur in Borneo, and in other islands to the east, but are absent from the Himalayan or northern region; one or two do get as far as Burmah and Cambodia, but there they disappear. Thus our conifers appear to have invaded the peninsula from two directions. The lowland ones from the north, the mountain ones from the east. All the latter occur in Borneo also with the addition of two more *Podocarps* *P. imbricatus* Bl. and *P. Teysmanni* and another genus, *Phyllocladus* *P. hypophyllus*, Hook fil.) of which the other known species come from New Zealand, Tasmania, the Philippines and New Guinea. There is one more genus which we might expect to find in the Peninsula, but which certainly has not yet been seen, and that is the northern genus *Pinus* of which one species, *Pinus Merkusii* Jungh. occurs in Tenasserim, Sumatra and Borneo.

In all our conifers except *Agathis* the ovule when ripe is drupaceous and red in colour and these are swallowed and so dispersed by birds. *Agathis* like the pine trees has winged seed that can drift to but a short distance so that its dispersal over the large area it covers must have taken a very long time. It belongs to the group of *Araucarieae* which includes the genera *Araucaria* of South America, Polynesia and Australia; *Agathis* in Australasia and Polynesia and up through the Eastern Malay Archipelago to Penang and *Cunninghamia* and *Sciadopitys* of the Japanese and Chinese region.



## CONIFERÆ.

Trees or shrubs usually evergreen, with coriaceous ovate, linear or acicular leaves sometimes reduced to scale leaves. Flowers unisexual usually on distinct trees, Perianth none, Males in catkins of scales bearing two or more anther cells, Females in catkins of scales each bearing one or two winged seeds, or solitary terminal ovules, on a scale leaf. Ovules naked, erect or decurved, winged, when in cones; drupaceous when solitary.

Distribution whole world chiefly in temperate climates.

Leaves ovate, fruit a cone	<i>Agathis</i>
Fruit drupaceous, Ovule erect,	<i>Dacrydium</i>
Ovule decurved adnate to the scale.	<i>Podocarpus</i>

## AGATHIS.

Big tree with coriaceous ovate leaves. Male cones cylindric of numerous scales bearing ten or twelve pollensacs, Female cone large more or less globose of large scales spirally arranged imbricate with broad tips. Ovuliferous scale thin and confluent with the scale. Ovules 1 or 2 adnate to the scale. Seed 1 compressed winged, albumen fleshy, cotyledons 2.

*A. loranthifolia*, Salisb. Trans. Linn Soc. VIII. 312. t. 12. *A. rhomboidalis*, Warburg Monsunia I. 184 t. VIII. c. *A. Dammara*, Rich. Conifer 83. t. 19. *Dammara alba*, Rumph. Herb. Ambon II. 174 t. 57. *D. Orientalis*, Lamb. Pin. Ed. 97. t. 54.

A lofty straight-stemmed tree with flaky bark very resiniferous. Leaves in pairs stiffly coriaceous, lanceolate, elliptic lanceolate or ovate obtuse, base very shortly narrowed, 2 to 3 inches long, 1-1 $\frac{1}{4}$  inch wide with a decurrent petiole  $\frac{1}{4}$  inch long. Male spike cylindric obtuse, 2 to 2 $\frac{1}{2}$  inches long. Scales  $\frac{1}{4}$  inch long, oblong, obovate with a straight claw, apex broadly rounded. Pollensacs 10 or 12. Female spike cylindric obtuse 2 inches long. Cone sub-globose, flattened at the top.

Pahang, Gunong Tahan (Robinson). Selangor, Bukit Kutu: Semangkok Pass, track to Sempang mines. Perak Waterfall Hill Taiping (Wray) Common at Maxwells hill and upwards. Penang Hill 2500 feet (Curtis), (Fox 12706) Kedah, Gunong Jerai (Ridley).

Distrib. Malay Archipelago. "Poko Damar Minyak."

Warburg. lc. broke up the *Agathis* of the Malay region into a number of species very imperfectly described. The Malay peninsular one of which he seems only to have seen a specimen from Lambert's collection of doubtful origin, but probably Penang, he describes as *A. rhomboidalis*. The differences in his various species seem to be so slight, and probably either



local or due to some slight variation on a branch or tree that I think it inadvisable to adopt them. Specimens from Gunong Tahan differ from the common Malay form in the much thicker and rounder leaves.

#### DACRYDIUM.

Trees often attaining a great size, unisexual. Leaves acicular, linear or scale-like. Male cones small, scales lanceolate with 2 anther cells. Female flowers solitary on the ends of the branches. The ovuliferous scale broad rounded free, Ovule erect the micropyle pointing upwards. Ripe seed drupaceous small.

Leaves of two forms, in young plants acicular. In adults scale-like.

Leaves of one form acicular

*D. elatum.*

Leaves linear falcate

*D. Beccarii.*

*D. falciforme.*

*Dacrydium elatum*, Wall. Cat. 6045. Hook. fil. Flora British India V. 648. A big tree 80 feet or more tall and 2 to 3 feet in diameter. Bark reddish brown. Leaves of two kinds. (1). Those on young trees, or shoots of older ones, acicular angled, acute appressed,  $\frac{2}{5}$  inch long, appressed to the stem. (2). Those on the fertile branches, and on all adult trees, close imbricate scales, very small, 1 m. m. long, dark green, bluntly lanceolate. Trees unisexual. Male cones on short branches  $\frac{1}{2}$  inch long, cones cylindric, yellowish green,  $\frac{1}{8}$  inch long, blunt. Scales ovate, triangular green with a scarious edge, anther cells globose white. Female flowers terminal on the fertile shoots, uppermost leaf (bract) ovate 2 m. m. long above a broader semi-orbicular truncate scale. Ovule ovoid, obtuse, obliquely placed on the apex of the shoot,  $\frac{1}{8}$  inch long and as wide at the base. When ripe bright red.

Common at high altitudes above 2000 feet elevation in the mountains of the Northern part of the peninsula, Pahang, Gunong Tahan (Robinson, 2354 and 5380) Telom (Ridley), Penang Hill (Curtis, 2880), Kedah Peak (Ridley).

Distribution Tonkin, Tenasserim (Fl. Brit.) Ind Sumatra, Borneo, Philippines and Fiji islands.

The tree is known as Ru Bukit (lit. Mountain Casuarina) from its resemblance to a Casuarina. It has long been cultivated in Singapore from Penang hill plants, and there forms a large cone-shaped bush, flowering in June. The locality "Singapore Schomburgk," given in the Flora of British India is from one of these garden plants. The young tree till it is about 14 feet tall, has only the needle like leaves, and is very handsome resembling a young spruce fir; full grown trees have only the scale leaves, except where pruned on the old wood when they produce branches of acicular leaves.



*D. Beccarii*, Parl. Dec. Prodr. XVI. 2 294 Pilger, lc. 52.

A dwarf bushy tree about 15 feet tall or less, leaves all acicular, half-an-inch long in barren stems,  $\frac{1}{4}$  inch long in fertile branches, angled and grooved. Male cones not yet known. Female flowers ovule ellipsoid, ovoid, blunt,  $\frac{1}{8}$  inch long, one or two on a short branch with numerous short acicular leaves.

Malacca, Mt. Ophir (Hullett, Ridley 3155) Perak, Bujong Malacca at 4000 feet (Curtis 3302) Selangor, Mengkuang Lebar at 1800 feet (N. Dennys) Also Borneo on Mt. Poe (Beccari. Foxworthy.)

A very distinct species in its dwarf habit and absence of any scale leaves. The ovules are much bigger than in *D. elatum*. It seems to take the place of this latter in the southern part of the peninsula.

*D. falciforme*, Pilger. Pflanzenreich IV. 5 *Taxaceæ* 45 Pl. 4 *Podocarpus falciformis* Parl. Dec. Prod. XVI. 685.

A big tree with dark colored bark leaves, distichous, obliquely linear sigmoid coriaceous, flat, acuminate, mucronulate, midrib grooved, inconspicuous, 1 to  $1\frac{1}{2}$  inch long  $\frac{1}{4}$ — $\frac{3}{8}$  inch wide. Male cone cylindric half-an-inch long, scales very small, ovate acute, or cuspidate. Female flowers forming a very short branch, scales numerous, triangular, acuminate, keeled, ovule 1 terminal, pedicel very thick, concave above the base, when further advanced the branch becomes thicker and the scales fleshy.

Selangor, Semangkok Pass towards the Sempang mines (Ridley 12068). Also in Lingga island on Gunong Dai at the foot of the hill up to 1000 feet (Hullett 5695) and in Sarawak top of Mt. Matang (Ridley 11669) and reported from the Philippines.

I have seen no female flowers. The tree attains a height of about 80 feet with a trunk girth of 10 to 12 feet.

#### PODOCARPUS.

Trees usually unisexual. Leaves of one form ovate, acuminate, or linear, or of two forms acicular and linear, distichous on the same branch. Male inflorescence a catkin, scales numerous, lanceate, acuminate with 2 anther cells. Female flowers solitary, axillary or several in a short raceme. Bracts one or more forming a fleshy peduncle. Ovule adnate to the ovuliferous scale, reflexed with the micropyle below, Seed large or small, globose or ovoid, drupaceous, red or purple on the thickened fleshy peduncle. Species 40 Tropical and south temperate regions of both hemispheres.



Leaves all similar ovate	<i>P. Wallichianus.</i>
Leaves all similar linear	
Male spikes solitary or in pairs	<i>P. neriifolius.</i>
Male spikes numerous	<i>P. polystachyus.</i>
Leaves dimorphic	<i>P. cupressinus.</i>

*P. Wallichianus*, Presl. Bot. Bemerk. (1844) 110 Pilger Pflanzenreich p. 59. *P. latifolia* Wall. Pl. As. rar. 26 t. 30 (non Thunb) Parl. Dec. Prodr. XVI. 2. 508.

A medium sized tree with opposite or sub-opposite leaves, the pairs inch apart, the leaves are coriaceous ovate or lanceolate ovate, caudate, acuminate, narrowed at the base, 4-7 inches long,  $1\frac{3}{4}$ - $2\frac{1}{2}$  inches wide. Flowers male and female on the same branch 5 to 9, the males at the top. Male spikes crowded about 6 together on a peduncle about an inch long with several bracts at the base of the spikes. Spikes white nearly cylindric, about  $\frac{3}{4}$  inch long, anthers very numerous, scale acuminate (ensiform cuspidate) cells elliptic 2. Female flowers solitary on peduncles as long as those of the males on a thickened fleshy receptacle, bearing about 6 short leaves. Fruit large globose, half an inch through, purple.

Singapore near Changi and Krangi: Johor Mt. Austin; Bukit Soga (11223 Ridley): Negri Sembilan, Gunong Angsi: Dindings, Gunong Tungul; Perak, Kinta (Wray.)

Distrib. India, Burmah, Sumatra Sungei Kelantan.

I have never been able to find a full sized tree or fruit or flowers of this plant. Wray's specimen has however, traces of fruit. It occurs in lowlying deep and dense forests in the plain country. The description of flowers and fruit is taken from Wallich's figure and description.

*P. neriifolius* Don Lamb. Pin. Ed. i 21 Parl. Dec. Prodr. XVI. 2. 514 Pilger Pflanzenr. lc. 80. *P. bracteata* Bl. Enum. Pl. Jav. 88 Rumphia III 214.

A very variable tree from 60 to 100 feet tall. Leaves coriaceous, linear, long and gradually acuminate, 4-6 inches long by  $\frac{1}{4}$  to  $\frac{1}{2}$  inch wide, gradually narrowed to the base, petiole  $\frac{1}{8}$  inch long or less. Male spikes short, half-an-inch long rather thick, solitary or two together on short peduncles with several short, ovate, thick polished scales at the base. Anthers crowded densely with a short point. Female flowers solitary or in pairs axillary on the upper axils of the branches, pedicel  $\frac{1}{10}$  inch long, receptacle cylindric, rather longer, ovule ellipsoid.

Usually on hill forests from 1000 to 5000 feet alt. and very variable in height and form of leaf.



Johor, Bukit Banang, Batu Pahat (Ridley 11192). Immense trees over 100 feet tall and thick in proportion. The leaves I got of this are 6 inches long by  $\frac{3}{4}$  inch wide, broadly linear and abruptly acuminate at the tip. No flower procurable.

Pahang, Gunong Tahan (Robinson 5452) at 5-6000 feet. A form with very thickly coriaceous leaves rather narrow. Malacca Mt. Ophir, Padang Batu (3158 Ridley and 10016) 3000 feet alt. Moderate sized tree with stiff leaves resembling specimens from Nepal (Wallich). Selangor, Bukit Hitam (Kelsall 2000) Penang Government Hill, (Curtis 3079) and Balik Pulau, a tree about 50 or 60 feet with thinner and in adults rather shorter leaves, resembles a plant from Tayabas, Luzon (Merrill 1992.)

The distribution of this species is recorded by Pilger from Nepal and Khasiya, China, Java, Sumatra, Borneo, Celebes, Batchian, and New Guinea.

*P. polystachyus*, R. Br. Mirb. Mem. Mus. XIII. 75. Bennett Horsf. Pl. Jav. 40. Parl. Dec. Prodr. XVI. 515. Pilger lc. 79.

A rather short much branched tree about 20 to 40 feet tall, with flaky bark. Branches spreading sub-whorled densely leafy at the tips. Leaves lanceolate, linear, narrow, narrowed at the tip and still more at the base, blunt, coriaceous, dark green, with a prominent midrib, 3 inches long,  $\frac{1}{4}$  inch wide, petiole  $\frac{1}{10}$  inch long, trees unisexual. Flower spikes male, very numerous, crowded in axillary tufts, yellow, 1-1 $\frac{1}{2}$  inch long,  $\frac{1}{8}$  inch through, anthers densely crowded. Female flowers several together or solitary in the axils of the upper leaves, peduncle very short,  $\frac{1}{10}$  inch long, receptacle swollen, cylindric,  $\frac{1}{4}$  inch, with a longitudinal groove and a single short, conic, acute leaf. Ovule club-shaped. Ripe seed red,  $\frac{1}{4}$  inch long, ellipsoid.

Common in mangrove swamps; Singapore Kranji, Changi (Ridley 165) Serangoon (3367); Pahang, Rumpin river and Kwala Pahang (Ridley 1441); Johor. Also in Sumatra.

Native name S'tada, Sintada.

A curious form from the Changi beach No. 6001 of my collection, has longer leaves, 6 inches long and  $\frac{1}{2}$  inch wide with very slender spikes 1 to 2 inches long with remote anthers.

*Podocarpus cupressinus*, R. Br. Mirb. Geogr. Conif. in Mem. Mus. XIII. 75. Bennett. R. Br. Pl. Jav. rar. I. 35 t 10. Blume Rumphia III. 218 t 172 f. 2, 172 B. f. 2. Parl. De. Prod. XVI. 2 521. *P. imbricatus*, Bl. Enum. Pl. Jav. 89. Pilger lc. 56.

A tall tree about 60 feet high rather straggly in forest, forming a compact cone-shaped tree when in the open, much branched. Bark smooth on the branches, reddish brown,



flaking off here and there on the trunk. Leaves of two forms (1) on the branches linear terete, decurrent, mucronate,  $\frac{1}{8}$  inch long, appressed, or at length longer with a broader base and more flattened, dark green. (2) leaves on terminal shoots distichous, flattened,  $\frac{1}{4}$  inch long, mucronate, glaucous, green. Trees unisexual, male cones axillary on the branchlets below the terminal distichous leaves, on a peduncle  $\frac{1}{10}$  inch long, covered with short subterete leaves, cone cylindric, obtuse  $\frac{3}{8}$  inch long. Antheriferous scales about 40, lanceolate, acute, with 2 ovoid globose yellowish white anther cells. Females. Ovules solitary borne on the ends of short branches,  $\frac{1}{4}$  inch long, covered below with very short thick, mucronate leaves, those at the tip surrounding the flower longer,  $\frac{1}{8}$  inch long. The ovule is supported on a yellow papillose peduncle bearing two or three terete slightly clubbed fleshy leaves. The ovuliferous scale is adnate to the decurved ovule which is reddish brown and  $\frac{1}{8}$  inch long. The ripe seed is very small and bright red.

On hills from an altitude of about 1000 feet and upwards.

Johore. Gunong Pulai (3716 Ridley). Selangor, Bukit Hitam (Kelsall 1984), Semangkok Pass (Ridley 8635, Burn Murdoch 11964). Pahang, Kluang Terbang (Barnes 10907). Penang Hill (Curtis). Kedah Peak (Griffith).

Distrib. North Burmah, Hainan, Sumatra, Java, Borneo, Celebes.

The tree flowers more or less most of the year, but chiefly in June. Though never met with at a lower elevation in a wild state than 1000 or 1500 feet, it grows very readily in Singapore, where it forms a very handsome bushy tree.

#### GNETACEÆ.

The *Gnetaceæ* comprise three genera now existing extremely dissimilar, of which the only genus in our region is *Gnetum* of which there are upwards of twenty species distributed over tropical Asia, Africa one species, Polynesia one and South America.

All our species but two are stout woody climbers. One *Gnetum Gnemon* L. is a tree of some size, the other a small shrub, *G. Brunonianum* — *G. Gnemon* known in the peninsula as Maninjan is occasionally to be seen in Singapore and more abundantly in Penang in gardens where it is more or less planted for its pleasantly tasted nut-like seed. It is not a native of this region but is said to have been introduced from Java. It is given in the Flora of British India (where however it is confused with the very distinct *G. Brunonianum*) as a native of Khasia and Munnipore. It attains a height of about fifty feet and a diameter of trunk about 6 inches or more.



The climbing species generally attain a great size and form often conspicuous lianes in the forests. The bark is tough and used for tying by the Malays.

## GNETUM.

Woody climbers, or rarely erect trees or shrubs unisexual. Leaves opposite, coriaceous, ovate, lanceolate or oblong, penninerved petiolate. Inflorescence spikes of circular saucer shaped bracts containing sessile flowers usually surrounded by multicellular hairs, spikes solitary or paniced axillary or terminal. Male flowers minute of a tubular clubbed perianth and a single stamen with two celled anther. Female flower of an ovoid or globose ovule, the inner tegument prolonged into a slender exerted tube. Seed thinly drupaceous, pink or red.

Species about Pacific-islands, Malay Archipelago and Peninsula, Northern India, Africa and South America.

A big tree,

*G. Gnemon.*

A low shrub,

*G. Brunonianum.*

Woody climbers

Seed sessile, not narrowed into a stalk at the base, spikes simple.

Seed blunt at both ends

Spikes long. Seed half an inch long.

*G. microcarpum.*

Spikes stout, very woolly. Seed half an inch long

*G. macrostachyum.*

Spikes slender not woolly 6 inches long.

Seed 1 inch long

*G. penangense.*

Spikes a foot long whorls distant

*G. longispica.*

Seeds few, large, acute at the tip, brown, corky

*G. edule.*

Spikes branched.

Seed 2 inches long fusiform

*G. latifolium*

Seed stalked.

A stout woody climber

*G. funiculare.*

A slender climber with thin leaves

*G. tenuifolium.*

## GNETUM.

## TREES.

*Gn. Gnemon*, L. Mant. 125. A big tree known in the Straits as "Maninjau" cultivated occasionally in Penang and Singapore and said to be introduced there from Java. The seeds are eaten and taste like hazelnuts.



*G. Brunonianum*, Griff. Lindl. Veg. Kingdom 233. Trans. Linn. Soc. XXII. 308 t 55 fig 9-20 and t 56, 27, 28, 41, 43, 44—47. Notulae 30 Kurz Flora LV 349. *G. Griffithii* Parlat. Dc. Prodr. XVI ii 349, 352.

A low erect shrub 2-5 feet tall, rarely much bigger, stem slender, pale green. Leaves lanceolate to oblong lanceolate, thinly coriaceous, base cuneate, apex acuminate, drying pale, nerves about 10 pairs, thin elevate beneath 4-6 inches long, 1-2 $\frac{1}{4}$  inch wide, petiole  $\frac{1}{8}$ - $\frac{1}{4}$  inch long. Male spikes in axillary pairs, peduncles  $\frac{1}{4}$  inch long with a pair of connate, subulate bracts,  $\frac{1}{10}$  inch long, pedicel shorter, spikes slender cylindric  $\frac{1}{4}$ - $\frac{1}{2}$  inch long glabrous with a pair of subulate, connate bracts at the base. Cupular bracts rather remote, flat orbicular, bearing a mass of short hairs in which are imbedded the male flowers mixed with some females. Perianth short, broad, entire, oblong, half as long as the filament, anther cells globose. Female spikes longer, peduncle  $\frac{1}{2}$ - $\frac{3}{4}$  inch long, subulate, bracts free to the base, whorls of ovules  $\frac{1}{8}$  inch apart or less in a spike of 1 inch long. Cupular bract rather broad ribbed. Ovules acuminate about 6 in a whorl of which only 2 or 3 develop. Ripe seed ellipsoid half-an-inch long, red.

*G. Gnemon*, besides being a big tree has much shorter spikes, the whorls closer set together, and thicker, the male flowers larger, with broader flattened perianth tube widely dilated upwards and lacinate at the tip, the anthers are larger, somewhat oblong and separate above. I do not think that in the male trees the female flowers mixed in the whorls ever develop.

Distrib. the whole peninsula and Borneo, originally collected by Griffith at Banlau in the Mergui islands; Johor, Gunong Panti (Ridley); Malacca, Ayer Keroh (Ridley 10752), Mt. Ophir (Hullett 767, 808; Ridley 3156 3157) Bukit Bruang (Derry 441, Goodenough 1338), Sungei Ujong (Cantley); Pahang Tahan river (Ridley 2330 5824), Kwala Tembeling; Telom (Ridley 13708). Selangor, Sungei Buluh (Ridley 13352) and Kwala Kubu. Perak Maxwell's Hill (Ridley 2783). Penang Government Hill at the Chalet (Curtis 878), Borneo, Sarawak, Matang (Hullett and Ridley 12272), Serudang (Haviland), Puak (Ridley.)

This little shrub which is not rare all over the peninsula in hilly forests up to an altitude of about 4000 feet has been confused with *G. Gnemon* L. in the Flora of British India from which it differs notably in its size, the latter being a tree of 60 feet or more tall with deep green leaves and longer spikes and larger fruit, while *G. Brunonianum* is a quite small shrub with pale green leaves and shorter spikes besides other differences in the flower.



It is called by the Malays Poko Ekor B'lankas (King crab's tail) and Pantat Ulat from the appearance of the male spikes. The fruit is sweet and eatable. There is some variability in the leaves, those of the Penang plant being unusually narrow and lanceolate. The venation varies too, in many plants, the nerves are fewer and form very conspicuous extra marginal loops.

Climbers, seeds sessile.

*Gn. microcarpum*, Bl. Rumphia IV. 6. t 175 and 1.

Rather slender woody climber, stems occasionally as much as half an inch through, with rough dark grey bark. Leaves lanceolate, cuspidate, acute, more rarely oblong, base narrowed or rounded, coriaceous, dark shining green, drying brown, 2-4 inches long, 1-2 inches wide, nerves 6-8 pairs, not conspicuous inarching close to the margin, reticulations rather wide moderately conspicuous, petiole  $\frac{1}{4}$  inch long. Male spikes in tufts on the stem, simple, cylindric,  $\frac{1}{4}$  inch long on shorter peduncles, cupular bracts cylindric, short, glabrous. Perianth oblong, truncate, flat, narrowed towards the base, apex blunt, entire. Stamen twice as long, filament slender, anther 2 celled club shaped. Female spikes in tufts from the stem, 1 inch long on pedicels,  $\frac{3}{4}$  inch long or less with ovate, acuminate, acute bracts, connate at the base. Cupular bracts cup shaped but rather flat ribbed, whorls  $\frac{1}{10}$  inch apart of 5 or 6 sessile conic subulate. Ovules surrounded by a circle of short rusty brown hairs, a little longer than the bract. Fruit half an inch long, cylindric elliptic, sessile, pinkish flesh color, borne on spikes 2-3 inches long.

There are two forms of this plant, one a slender twining climber with narrow lanceolate leaves which grows abundantly in open places in secondary scrub which might be called *campestris* and a stronger lofty climber with a stout stem half an inch or more through, and broad elliptic leaves with a rounded base, 2 inches wide. var *sylvestris*

var *campestris*.

Distrib. Singapore, Kranji (Ridley 5360), Changi (5863), Tanglin etc. Johore, Batu Pahat (Ridley 11219). Pahang, Kwala Pahang (1440.) Malacca, Mt. Ophir, Padang Batu (Ridley 10015), Ayer Panas (Goodenough 1560), Penang Government Hill (Curtis 877), and Batu Feringi (1109). Selangor Sempang mines.

var. *sylvestris*.

Singapore Garden, Jungle; Seletar (Ridley 3958), Bajau (5864) and Pulau Tekong (5862.)

It is known as "Akar Jullah" by the Malays.



Blume's figures and description of *G. neglectum* and *G. microcarpum* are hardly sufficient to distinguish the two species. Hooker refers this species to his *neglectum* with a? Judging by the colour of the seed, and its size and length of spike, I have little doubt that Blume's *G. microcarpum* is intended for this species. *G. neglectum* is figured with larger seed on six inch spikes of a dark claret color, instead of the flesh coloured pink of *microcarpum*.

*Gn. macrostachyum*, Hook fil. Fl. Brit. India V 642.

A stout woody climber with rough brown lenticellate bark. Leaves stiffly coriaceous, elliptic or elliptic lanceolate, shortly cuspidate, blunt, base rounded, or occasionally shortly narrowed 7-8 inches long, 3-4 inches wide, usually drying light brown, nerves nearly invisible above, slender, slightly elevated beneath, 4-6 pairs, reticulations fairly visible rather large and irregular, petiole rather thick,  $\frac{1}{4}$  inch long. Male spike (only seen young)  $2\frac{1}{2}$  inch long on a short peduncle,  $\frac{1}{8}$  inch long with a pair of ovate, acute, connate bracts, cupular bracts saucer shaped close together with much brown hairs between. Female spikes solitary or in pairs, one in each leaf, axil very shortly peduncled, cylindric, 3-4 inches long,  $\frac{1}{2}$ - $\frac{3}{4}$  inches wide, cupular bracts close set, saucer shaped, almost hidden in the dense brown wool surrounding the ovules of which it conceals all but the tip. Ripe spike about 4 to 6 inches long and  $\frac{3}{4}$  inch through, densely woolly. Seeds crowded, oblong, ovate, shortly acute, half an inch long, a quarter of an inch through.

Singapore, Siglap (Ridley 9207), Changi (4822 and Hullett) Jurong (Ridley 5566) and Bidadari (8918); Malacca, Bukit Bruang (Ridley); Prov. Wellesley, Krian (Ridley 9383).

*Gn. penangense* n. s.p.

Woody climber, Leaves elliptic to oblong cuspidate, coriaceous, drying black, nerves 4-5 pairs, base shortly narrowed, reticulations fine conspicuous beneath, 6 inches long,  $2\frac{1}{2}$  inches wide, petiole half an inch long. Spike in fruit from the stem stout, 6 inches long, peduncle 1 inch long, whorls  $\frac{1}{4}$  inch apart of about 6 ovoid acute ovules. Cupular bracts flat saucer like, a thin square mat of hairs below the ovule, and shorter than it. Ripe ovules oblong, 1 inch long, blunt at both ends.

Penang Government Hill (Ridley and Curtis 2223).

Allied to *G. microcarpum* but with the leaves of *G. funiculare* and very much larger spikes and ovules.

*Gn. longispica* n. sp.

A woody climber  $\frac{1}{4}$  inch through with warty bark. Leaves broadly lanceolate, narrowed almost equally at both ends, coriaceous, drying light brown, 6 inches long by 3 inches wide.



nerves 6 pairs inarching within the margin, reticulations small and inconspicuous, petiole stout, half-an-inch. Mature female, spikes a foot long with 24 whorls,  $\frac{1}{4}$  inch apart, peduncles 2 inches long, cupular bracts, saucer shaped ribbed, containing about 10 acuminate ovules almost concealed by thick brownish hair. Ovules little over half-an-inch long, ellipsoid, blunt at each end, without covering  $\frac{5}{8}$  inch long.

Selangor, Camphor forest, Rawang. Fruits dull brick red, (Ridley). Johor Kwala Batu Pahat, (Kelsall).

Allied to *G. microcarpum*, but with much longer spikes. The fruit of the Batu Pahat plant is larger than that of the Rawang, one being  $\frac{3}{4}$  inch long. The fruit otherwise resembles that of *G. microcarpum*. It may possibly prove to be a big form of that species.

Seed narrowed at the base not stalked.

*Gn. edule*, Bl. Nov. Pl. Fam. 31 V. 7. Rumph IV. 6. *Funis gnemoniformis*. Rumph Herb. Ambon.

A moderate sized woody climber, with reddish bark. Leaves stiffly coriaceous, shining lanceolate or oblong lanceolate, cuspidate, drying brown above, reddish brown beneath, nerves inconspicuous, 7 pairs, slender inarching within the edge, but almost invisible, reticulations obscure, very small, giving the under side of the leaf a papillose appearance under the lens, 5-6 inches long,  $1\frac{1}{2}$ - $2\frac{1}{2}$  inches wide, petiole  $\frac{1}{4}$ - $\frac{1}{2}$  inch long. Male spikes not seen. Female spikes solitary axillary on short  $\frac{1}{4}$  inch, peduncles 5 inches long, whorls  $\frac{1}{8}$  inch apart, rachis ribbed, cupular bract very short, and flat saucer shaped, with light brown hair longer inside. Ovules acuminate 4 or 5 in a whorl. Seed when ripe one or two only on the spike, 2 inches long, an inch through, elongate, ovoid, slightly narrowed at the base and bluntly, shortly acuminate at the tip, light brown corky warty, peduncle much thickened woody. Apex of seed acute, ribbed with many rather long fibrils.

Singapore, Toas, and Chan Chu Kang, (Ridley 6126). Pahang, Tahan river, (Ridley 2329), Pulau Rumpit, Pahang river (2332). Perak, Sungei Kertai, Temengoh (14548).

*G. edule*, Blume was based by him on Rumphius figure and description of his *Funis gnemoniformis*, which shows the solitary seed of large size nearly sessile, and described by Rumphius as "*Coloris hepaticæ*" liver-coloured which fits this plant. Roxburgh referred this plant of Rumph to the Indian species *Gnetum scandens* which is described as having a fruit as large as a large olive and which according to Wight's figure in the Icones Pl. 1955 under *Gn. funiculare* is utterly unlike our species or Rumph's figure. *G. scandens* Roxb. seems to be confined to India. Blume however, included Roxburgh's *G. scandens* in his description.



Spikes branched.

*G. latifolium*, Bl. Rumphia IV 5. Tab. 174.

A moderate sized climber with oblong lanceolate leaves, deep green, drying black, apex acuminate, blunt, base cuneate, (the leaves are often at least slightly inæquilateral) nerves about 8 pair, visible above, prominent beneath as are the reticulations, 5-6 inches long, 2-3 inches wide, petiole  $\frac{1}{4}$  to nearly  $\frac{1}{2}$  inch long. Male spikes cylindric, usually 5 together, 1 to  $1\frac{1}{2}$  inch long. Bracts saucer shaped, green, approximate. Perianth wedge, shaped with a broad top nearly as long as the filament, anther cells separate. Females 2 or 3 in a tuft from the trunk, branched with few lax branches, spreading, whole inflorescence 6 inches long. Branches about 6, remote, over an inch apart, peduncles of spikes  $1\frac{1}{4}$  inch long, spikes 2 inches long, whorls distant  $\frac{1}{8}$  inch apart, glabrous. Bract funnel shaped. Ovules 6-7 in a whorl ovoid, not beaked. Ripe seed on a spike a foot long, rachis much enlarged and thickened, zigzag seed 2 inches long, fusiform base abruptly narrowed into a cylindric stalk  $\frac{1}{4}$  inch long, apex bluntly conic.

Pahang Telom (Ridley 13709) on a fallen tree by the stream.

Distrib. Malay islands.

Blumes' figure is an excellent one and exactly suits the Telom plant.

A specimen distributed by the Philippines Bureau as *Gn. latifolium*, Bl. from Lamao River, Mt. Mariveles 1805, closely resembles this in foliage and inflorescence but the fruit is smaller and distinctly stipitate.

Species with fruit stalked.

*G. funiculare*, Bl. Nov. Pl. Fam 32. Ann. Sc. Nat. Ser. 2. V. 2. 106. Rumphia IV 7. *Abatua indica* Lour. Fl. Cochinch. 630. Hook. Fl. Brit. Ind. V. p. 642.

A very stout woody climber with black bark, stem 2 inches through. Leaves thickly coriaceous, dark green, drying black polished oblong to lanceolate, oblong or ovate oblong, cuspidate or blunt, nerves 6 or 7 pairs, 5 to 6 or 7 inches long,  $2\frac{1}{2}$  to 3 inches wide; petiole  $\frac{1}{4}$ - $\frac{1}{2}$  inch long. Male spikes stout, cylindric, 1 inch long, densely crowded on knots on the trunk on pedicels half-an-inch long, green with yellow stamens. Cupular bracts overlapping circular, saucer shaped, containing abundance of brown multicellular hairs about as long as the bract. Perianth elongate, goblet-shaped from a narrow base, apex broad,  $\frac{2}{3}$  the length of the stamen. Stamen with a stout filament and 2 distinct globose cells. Female inflorescence of opposite pairs of pedunculate spikes on main peduncles, over an inch long. Bracts connate at the base, subulate,  $\frac{1}{8}$  inch long. Secondary



peduncles  $\frac{1}{4}$  inch long, spike  $\frac{3}{4}$  inch long. Bracteoles funnel shaped, wide. Ovules ovate, acuminate, 6 in a whorl, surrounded by a dense tuft of brownish hairs. In fruit the spikes are 6 inches long. Seed ellipsoid, blunt at the tip, half-an-inch long, and nearly as thick, red on a stalk,  $\frac{1}{4}$  inch long.

Distrib Singapore Garden Jungle (8074 Ridley), Kranji (Ridley 1612 and Tanglin 5688); Johor, Batu Pahat (Kelsall); Pahang, Tahan forests (Ridley 2329); Malacca, Ayer Keroh. (Ridley 107561), Selandor (Cantley) Negri Sembilan, Bukit Danan (Cantley) Selangor, Ulu Gombak (Burn-Murdoch). Perak the Cottage, Taiping Hills (with very small leaves); Penang, Government Hill (Curtis) by the Waterfall (3660).

It is also recorded from Assam, Pegu and Burmah in the Flora of British India.

The Natives call it "Akar Tutubo" and Akar Suburus.

*Gnetum tenuifolium*, n. sp.

A slender climber turning over bushes, Leaves opposite, oblong, lanceolate, acuminate, with usually a long point, thin textured, narrowed at the base, nerves 6-8 pairs elevated beneath, interarching well within the margin, reticulations inconspicuous, 4-7 inches long, 1-2 $\frac{1}{4}$  inch wide, petiole  $\frac{1}{4}$  inch long. Male spikes solitary or 2 together on the stem unbranched, on peduncles, 1 inch long, slender with a pair of connate acuminate bracts  $\frac{1}{10}$  inch long, pedicel of spike  $\frac{1}{2}$  inch long, slender, spike slender, 1 inch long,  $\frac{1}{8}$  inch through. Female spike solitary on a shorter and thicker peduncle, unbranched, 2-3 inches long, ovules in whorls of 8 to 10  $\frac{1}{8}$  inch apart, surrounded by short brownish hairs with a cup shaped bract below. Seed spikes 4 inches long. Unripe seed acuminate and when dry narrowed at the base, ripe ellipsoid with a short acute point on a pedicel half an inch or more long, slender, seed ellipsoid acute, finely ribbed, half-an-inch long.

Lankawi (8341). Kasum (Curtis 3244). This also occur in Malacca at Bukit Sadanen (Goodenough 1431) and Bukit Tampin (Goodenough 1918) Selandor and Chabau (Cantley), Negri Sembilan on Gunong Angsi (Ridley): Selangor at Kwala Lumpur (Ridley 10213), Pahang, Tanjong Antan (2331 Ridley); Perak, Taiping (Ridley 14565); the Dindings on Gunong Tungul; Penang Waterfall stone quarry (Curtis) and Balik Pulau (32204) Kedah at Yan.

It is known as Akar Putat, and Akar Dagun and Akar Mantadu in Malacca and Negri Sembilan according to Cantley's collector who says that the Jakuns eat the fruits.

It is a very distinct plant in its thin twining stems only  $\frac{1}{8}$  inch through and long pedicelled fruits and thin leaves.



## CYCADEÆ.

Shrubs or small trees with a thick simple or branched trunk with a terminal crown of leaves. Leaves pinnate or bi-to tri-pinnate, coriaceous, large. Flowers dioecious. Males in a terminal cone of hard peltate or flat scales bearing numerous, crowded, 1 celled anthers, or pollen-sacs. Females of flat carpellary leaves (carpophylls) bearing several ovules on the edge, arranged in a whorl at the top of the stem. Ovules large, sessile. Seeds large drupaceous, albumen copious.

Distributed all over temperate and tropical regions. Only genus here *Cycas*.

Trunk rough. Carpophylls elongate, *C. Rumphii*

Trunk smooth white. Carpophylls short,  
broad pectinate *C. Siamensis*

*Cycas Rumphii*, Miq. Bull. Sc Phys. et Nat Neerl 1839. Monogr. 29. Anal Bot. Ind. ii t. 5; 6; A & B. Linnœa XVII 688. Hook fl. Fl. Brit Ind V 657. *C. circinalis* Roxb. Fl. Ind. iii 744. Griff. Notul. VVI. Ic Pl. As. t. 361 (not of Linné) *C. circinalis* var. *angustifolia* Miq. Comm. 119. *C. Wallichii* Miq. Monogr. Cyc. 32. *C. glauca* Miq. Monogr. 30 *C. macrocarpa*, Griff. Notul IV II. Ic Pl. As. t. CCCLXIII f2

Stem from 4 to over 20 feet tall, cylindric, brown, usually branched, and often emitting axillary buds usually about 1-2 feet through, covered with the rough leaf bases. Leaves simply pinnate 6 feet long and 2 feet across, very coriaceous; petiole 6 inches long armed with short thorns in the upper part, leaflets linear, acuminate, base decurrent on the rachis, 12 inches long, half-an-inch wide or narrower and shorter, midrib strong and prominent. Plants unisexual, Male cone about 1 foot long, orange colour, Antheriferous scales obcuneate apex shaped, broad with a long acuminate spine from a broad base,  $\frac{3}{4}$  inch long,  $\frac{1}{2}$  inch wide at the apex, spine upcurved, half an inch long, pollen sacs very numerous, small, white, globose. Female carpophylls 9 inches long, petiole flattened,  $\frac{1}{4}$  inch across, gradually dilating into the limb which is lanceolate and dilated at the end,  $\frac{1}{2}$  an inch across and shortly toothed, and ending in a long point,  $\frac{3}{4}$  inch long, all orange-woolly. Ovules 4-6. Seed ellipsoid globose orange an inch through.

Singapore Changi (Ridley 3940 and 4408), Pulau Tekong  
Tampenis river; Pahang Pekan, Rumpin river, on sea shores,  
Raub Track (Machado) in forest; Perak, Kamuning, Limestone  
rocks; Adang Islands, Tanjong Hantu, Rawei.

Distrib South Tenasserim, Mergui, Malay Islands to North  
Australia.



Native Name "Pakis Laut" on account of the circinate vernation of the young leaves. A starch is obtained from the trunk, and the young leaves are eaten as a potherb. Usually this inhabits sandy spots near the sea, or on the sea beach, but I have met with it far inland in forests, *e.g.* at Kamuning. It is probable that in these cases, the plant has remained here since the formation of the alluvial flats now between it and the sea.

It was probably much more abundant on our sandy coasts but has disappeared except where isolated in gardens, owing to these spots being cleared and cultivated for coconuts.

The male cone has a strong odour of lady-birds, the pollen which is very abundant is said to be strongly narcotic.

*Cycas Siamensis*, Miq. Bot. Zeit 1863-334. Hook fl. Fl. Brit. India lc. 647.

Stem about 15 feet long, cylindric, but swollen abruptly at the base, smooth nearly white. Leaves about 3 feet long and 8 inches across, coriaceous, light green, petiole 1 foot long,  $\frac{1}{4}$  inch wide, thorny in the upper part, Leaflets about 70 pairs narrow, linear, acuminate,  $\frac{1}{4}$  inch across, midrib slender. Male cone. "Antheriferous scales  $\frac{3}{4}$  inch long with a slender point as long." Female carpophylls, petiole 3 inches long about  $\frac{1}{4}$  inch across, flattened, limb obovate with very long slender processes about 30, one to two inches long, narrow, acuminate. Whole carpophyll orange, woolly. Ovules few 3 or 4.

High up on limestone rocks. Terutau (Curtis 2427) Setul and Perlis

Distrib. Dry forests of the Prome district, Shan States and Cochin China.





Ridley, H. N. 1911. "The Gymnosperms of the Malay Peninsula." *Journal of the Straits Branch of the Royal Asiatic Society* 60, 53–68.

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